COMMERCIAL FISHERIES Review

VOL. 32, NO. 11 NOVEMBER 1970

U.S. DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration

National Marine Fisheries Service

U.S. DEPARTMENT OF COMMERCE
Maurice H. Stans, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Dr. Robert M. White, Acting Administrator

NATIONAL MARINE FISHERIES SERVICE
Philip M. Roedel, Director

COVER: Biologists of the National Marine Fisheries Service (NMFS), Beaufort, North Carolina, are studying populations of estuarine fishes, such as menhaden. It requires some close-in work with a gill net.

The samples collected will be used to determine size, composition, seasonal abundance, and distribution of estuarine fish species.

With this information, scientists are developing a detailed "Estuarine Case History." The goal is to establish the basic principles governing the ecology of estuaries. NMFS Beaufort scientists hope to manipulate an estuary's productivity and to predict the effects of changes caused by man.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the National Marine Fisheries Service (formerly Bureau of Commercial Fisheries).

Fishermen's Memorial
Gloucester, Mass.

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Throughout this book, the initials NMFS stand for the NATIONAL MARINE FISHERIES SERVICE, part of NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), U.S. Department of Commerce.

Address correspondence and requests to: Commercial Fisheries Review, 1801 Nor Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

Use of funds for printing this publication was approved by the Director, Bureau of t Budget, April 18, 1968.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.
Price 60 cents (single copy). Subscription Price: $7.00 a year; $2 additional for foreign mailing.

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Unloading the catch. (R. K. Brigham)

THE FISHERY PRODUCTS SITUATION

Donald R. Whitaker
Current Economic Analysis Division, NMFS

Except for a few species, such as sea scallops and king crab, fish and shellfish supplies were generally adequate for trade needs in the first 9 months of 1970. Liberal supplies of some finfish species were available.

Consumption of fishery products will increase again this year on both a total and per-capita basis. Prices have averaged higher than a year ago at all levels. This indicates a strong demand for fishery products in general. Higher prices have attracted considerable imports and, for the rest of 1970, supplies of many frozen products will be heavier than a year ago.

New England Food Fish

Catches of major New England food fish (flounders, cod, haddock, and ocean perch) are running about 10% below last year. This means consumption of fresh fillets of these species is down by a similar percentage. Prices of fresh fillets are up considerably this year and are expected to remain above year-earlier levels through the winter. Supplies of fresh fillets will be seasonally low through the winter.

Frozen Fish Fillets

Supplies of frozen fish fillets have been heavy all year, and consumption of major New England species has increased sharply. First-quarter consumption advanced 17% over a year earlier; second-quarter consumption was up 11%. Leading the increase were frozen cod fillets. Demand for frozen fillets shows little sign of easing, despite mostly firm or rising prices. Wholesale prices of frozen ocean-perch fillets have been averaging 25 to 30% higher than a year ago. Haddock fillets have been 4 to 6% above 1969. Wholesale prices of frozen flounder fillets have weakened in recent months because of abundant supplies.

Inventories of frozen fillets at the start of fourth-quarter 1970 were a fourth higher than last year because of much higher stocks of flounder and ocean perch. Stocks of cod fillets were down considerably from last year. Prices of frozen fillets rise seasonally in the winter. Heavy stocks may offset some of the seasonal increase; however, domestic catches of haddock will be small, so some substitution of other frozen fillets for haddock is expected.

Fish Sticks & Portions

Production of the popular fish sticks and portions was 10% above a year earlier in the first half of 1970. Consumption of fish sticks and portions was about 8% above the first half of 1969. Consumption was up despite higher prices, especially for cod sticks and portions.

Inventories of sticks and portions have been consistently higher than last year because consumption has been running at less than production. At the start of fourth-quarter 1970, inventories were a fifth higher than a year ago. Although supplies of sticks and portions are expected to be ample in the coming months, prices likely will continue higher than a year ago. This is mainly because prices of the raw material for sticks and portions have been rising this year.

Canned Tuna & Salmon

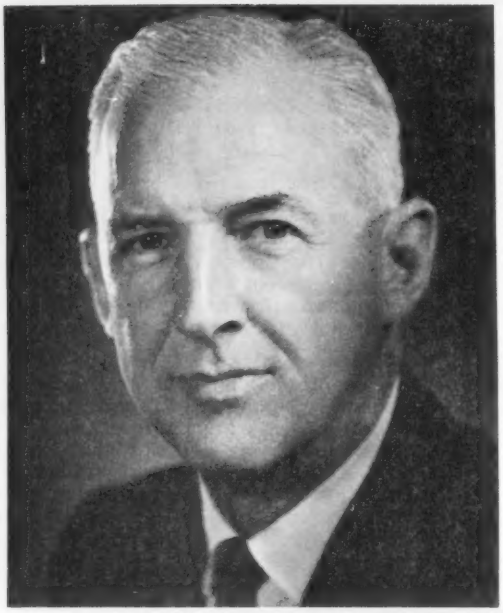
Supplies of canned tuna are running a little heavier than a year ago. Domestic production of canned tuna in oil has been higher, while imports of canned tuna in brine are running less than last year. Retail prices of canned tuna are averaging 11% above last year. Higher prices are the result of rising costs of raw tuna and of strong consumer demand.

Supplies of canned salmon will be greater during this winter than last year. Canned salmon appeared on the October Plentiful Foods list of U.S. Department of Agriculture. Prices of canned salmon are running below a year earlier.

Shrimp & Oysters

Shrimp supplies have been relatively heavy all year and consumption has increased. Shrimp will be abundant for the rest of 1970, and wholesale prices likely will average lower than a year ago. Oysters are also expected to be a little more plentiful than during last winter. Supplies of most other shellfish are lighter than last year, and firm-to-strengthening prices are in prospect for the fourth quarter.

JOHN GOTTSCHALK JOINS NMFS



John S. Gottschalk

John S. Gottschalk has been named assistant to Philip M. Roedel, Director of the National Marine Fisheries Service (NMFS). Mr. Gottschalk was Director of Interior Department's Bureau of Sport Fisheries and Wildlife for the past 6 years; from 1959 to 1964, he directed that Bureau's regional office in Boston, Mass. He joined the U.S. Fish and Wildlife Service in 1945. He worked on river basin studies, Federal aid to States, and was chief of the Division of Fisheries.

His Duties

Mr. Gottschalk will advise Director Roedel on problems of sport fisheries. When the National Oceanic and Atmospheric Administration (NOAA) was established on Oct. 3, 1970, the research programs on marine sport fish formerly conducted by Interior Department were transferred to NMFS. Included were laboratories at Sandy Hook, N.J.; Narragansett, R.I.; Tiburon, Calif.; Panama City, Fla.; and Aransas Pass, Tex.

Mr. Gottschalk also will be liaison with recreational fishing groups in the United States. He will handle special studies: for example, unnecessary disputes between fishing groups.

Rich Experience

Mr. Gottschalk was born in Berne, Ind. He received an AB degree from Earlham College in 1934, and a Master's degree in fisheries biology from Indiana University in 1943. He served as Superintendent of Fisheries, Indiana Department of Conservation, from January 1938 to September 1941.

He is a past vice president of the Wildlife Society. In 1955, he received an American Motors Conservation Award, a national citation for outstanding service in conservation. He is also a past president of the American Fisheries Society.

Director Roedel said: "We are delighted to have a man of Mr. Gottschalk's knowledge, experience, and ability. He is nationally known as a conservationist and fishery scientist. We feel he is the ideal man to head up our marine sport fish program."

FEWER MID-ATLANTIC COAST FISH AND SHELLFISH FORECAST

The abundance of most fish and shellfish that support the Middle Atlantic Coast fisheries will decline in 1971, according to the Virginia Institute of Marine Science (VIMS) at Gloucester Point.

Striped-bass abundance is expected to decline somewhat but fish will be of good size. This species is cyclic: good broods are produced at about 6-year intervals. The hatch of young in 1970 appears to have been good. These fish will not enter the fishery in 1971, but they promise a good year for pan-size stripers in 1972.

Some Decline Inevitable

After the near-record year for spot in 1970, some decline in 1971 seems inevitable, VIMS states. The fish that supported the 1970 fishery were mostly 2-year-olds; a few will still be around in 1971 as 10-inch fish, but small fish will be scarcer than usual. "The result will be only mediocre spot fishing in 1971," notes VIMS.

Croaker and grey sea trout probably will continue to increase at 1970 rate, but the numbers will be far below their peak in the 1940s.

River Herring & Shad

The pound-netters begin their season in early spring, when the river herring and shad come into Chesapeake Bay and swim up rivers to spawn. In 1969, and again in 1970, the foreign trawlers, mostly Soviet, cut deeply into supply of river herring, which are backbone of pound-net fishery. VIMS points out that the success or failure of 1971 season probably will depend largely on extent foreign fishermen harvest this resource.

Shellfish Decline

Shellfish abundance also is expected to decline, except for surf clam, expected to increase sharply.

Catches of hard clams will be at about 1969 level because production has declined only slightly since 1963. Production of soft clams has declined sharply since 1965; no production is expected in 1970.

Blue Crabs

The VIMS prediction for blue crabs was for a smaller-than-average year-class available from September 1970 through August 1971. Small crabs hatched in 1970 were present in Virginia waters in late October, however. They are so numerous that scientists are predicting larger-than-average supplies for the 12 months beginning September 1971.

Oyster abundance has trended downward since 1960. Levels in 1970 were expected to be about equal to or slightly below 1969.

SUSQUEHANNA RIVER SHAD WILL BE AIDED BY NEW AGREEMENT

The State-Federal Advisory Committee for Susquehanna River Shad Studies and 5 power companies operating dams on the lower river have agreed to do more to restore American shad to the river above the dams.

The Susquehanna is one of the great rivers of the Atlantic seaboard. It drains a large part of New York State, about half of Pennsylvania, then passes through a small piece of Maryland before emptying into Chesapeake Bay. Before the dams were built, migratory fishes in abundance came up from the sea where they had spent part of their lives. Construction of dams 40 years ago severed the link between river and sea.

Fish Collection Facility

Key feature of the agreement is development and construction of a $500,000 fish-collection facility at Conowingo Dam in Maryland, near river's mouth, by Philadelphia Electric Power Co. and Susquehanna Power Co. It is expected to operate by May 1971, in time for next season of shad run.

50 Million Fertilized Eggs

Pennsylvania Power & Light Co., Safe Harbor Water Power Corp., and Metropolitan Edison Co. will spend an estimated $250,000 over 5 years to acquire and plant at least 50 million fertilized American shad eggs in Susquehanna or tributaries above Conowingo.

U.S. & States in Committee

The advisory committee consists of representatives of Maryland Fish and Wildlife Administration, Pennsylvania Fish Commission, New York Department of Environmental Conservation, and the Interior Department. The committee will monitor results of program to determine if more action, including construction of fishways, is needed.

Federal Power Commission

The agreement is subject to a decision by the Federal Power Commission that the cost to power companies can be classified as operating expenses.

FISHING ON UPPER MISSISSIPPI R. REFUGE PERMITTED BY SPECIAL RULE

A special regulation of the U.S. Department of the Interior's Bureau of Sport Fisheries and Wildlife permits, under certain conditions, commercial fishing--in addition to sport fishing and to taking of frogs, turtles, crayfish, and clams--in all waters of the Upper Mississippi River Wildlife and Fish Refuge during the open season in 1971.

This special regulation will be effective during Jan. 1-Dec. 31, 1971. The Refuge includes parts of Illinois, Iowa, Minnesota, and Wisconsin.

Maps Available

Maps delineating the 125,000-acre Refuge water areas are available at refuge headquarters, Winona, Minn. 55987; also, from Regional Director, Bureau of Sport Fisheries and Wildlife, Federal Bldg., Fort Snelling, Twin Cities, Minn. 55111.

VAST CALICO SCALLOP BEDS ENCOURAGE NEW FISHERY

Scientists have located extensive calico scallop stocks off North Carolina, Florida's east coast, and eastern Gulf of Mexico. Also, they have found small concentrations off South Carolina and Georgia. There are 1,200 square miles of scallop beds just off north Florida. The Florida area appears potentially best.

Calico scallops are so called because of their mottled shells. They are closely related to the bay scallop.

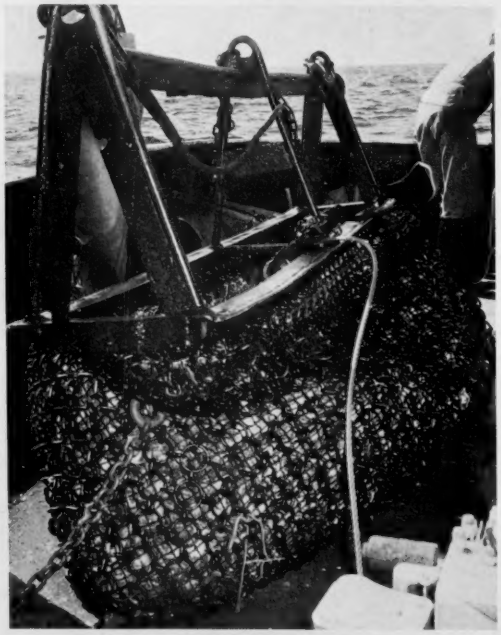
Tom Costello, chief of scallop investigations, NMFS Tropical Atlantic Biological Laboratory, Miami, Florida, says: "Although Florida landings of calico scallops in 1969 were only 160,000 pounds of shucked meats, the landings may be 15 to 20 million pounds by 1975." Most of the catch is now sold directly to restaurants. As landings increase, there will be limited distribution to food markets.

"We've known about these beds since 1960," adds Costello, "but we didn't realize how extensive they were until later when our scientists began making surveys of the beds. Our cruise reports helped stimulate the interest of commercial fishermen but, until recently, two factors prevented rapid development of these resources: One was the changes in location and productivity of the beds from year to year; the other was the lack of mechanical equipment for sorting, shucking and eviscerating the scallops."

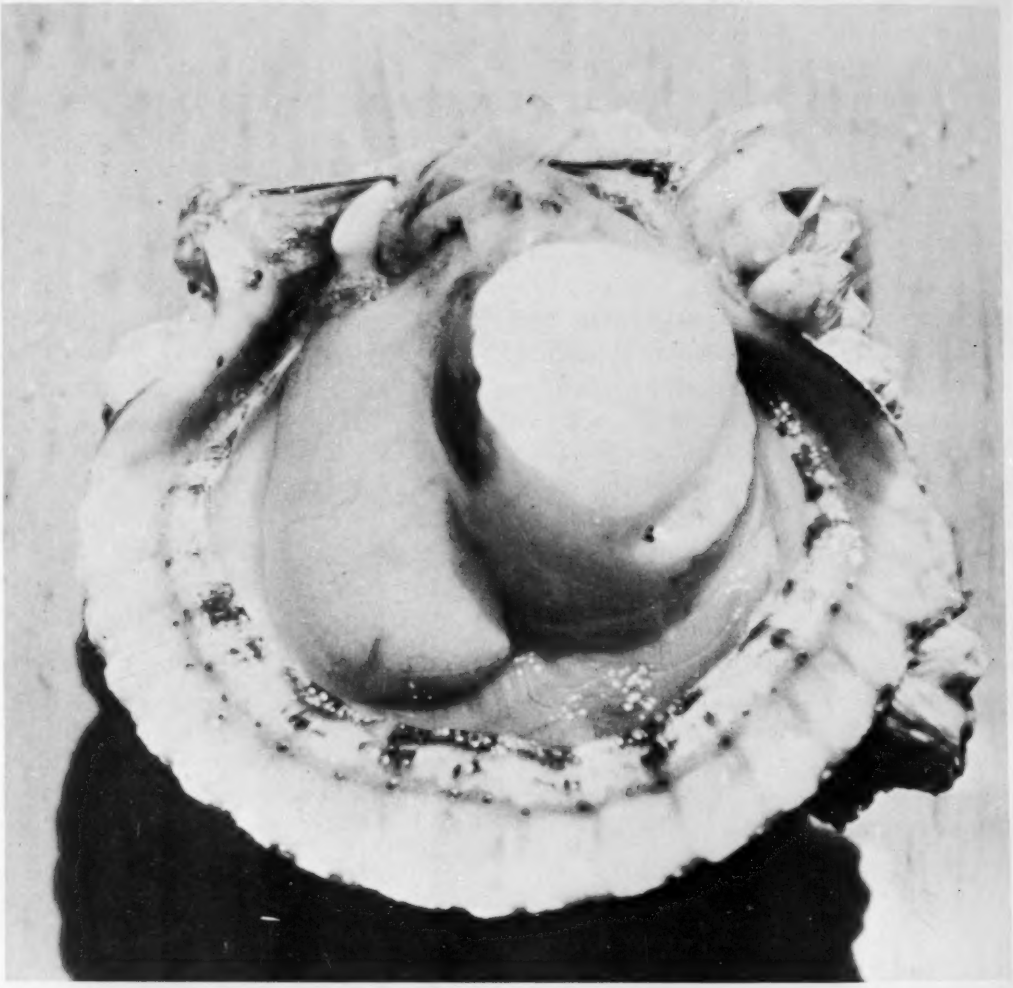
The Fishery

Four vessels designed specifically for scallop fishing and processing recently entered the fishery. They have the necessary equipment to process the catch as it is brought aboard. Scalloping trips usually last 5 to 8 days. While on the beds, fishing is continuous, day and night, with a 14-man crew working 12-hour shifts. Catches run as high as 200 pounds of processed scallop meats per hour, and average about 100 pounds per hour. These vessels have been so successful that the manufacturer may build more.

"Although we've done a lot to help in locating and assessing the beds," points out Costello, "industry has developed the sorting, shucking, and eviscerating machines."



A 40-bushel catch of calico scallops made with an 8' tumbler dredge aboard NMFS research vessel 'Oregon'.
(J. B. Rivers)



Calico scallop on $\frac{1}{2}$ shell. (L. May)

Calico scallops are small. Hand shucking has been economically feasible only where special labor and supply conditions have existed. Although the present machines do the job, industry continues to improve and modify them.

Locating Calico Scallops

Locating commercial concentrations has been one factor limiting industry growth. To help overcome this obstacle, NMFS scientists have developed new techniques to locate and assess the beds. One is RUFAS. (See page 8.) Using RUFAS, beds can be viewed, filmed, and charted quickly and economically.

This monitoring is required to assess annual concentrations of calico scallops soon after they spawn, usually in May and June. As the scientists locate beds, they prepare charts for industry showing commercial concentrations.

RUFAS fishery data are combined with catch information from commercial vessels. These data are used to determine the annual potential of major scallop beds so future predictions will be more precise and quickly available.

Age, Growth, Location Changes

To learn more about the age and growth rates of calico scallops, scientists have marked and released them for later recovery. This information enables researchers to predict when newly discovered beds of young scallops will reach harvestable size.

The scientists also are trying to determine why scallop beds shift from year to year. They have observed that most beds are in a north-south direction along the flow lines of coastal or Gulf currents. Typical beds are 100 to 300 feet wide, and up to 1,500 feet long. The average density is 4 scallops per square foot; sometimes, there are 8 per square foot.

The scientists believe that the location of new beds probably depends on currents and other environmental conditions that influence the free-swimming scallop larvae before they settle and grow. One hypothesis is that the calico scallop resource is an annual crop that will support an extensive harvest each year with only minimum brood stock required to reseed the grounds.

COUNTING SCALLOPS IN 150 FEET OF WATER

Counting scallops on the seabed is no problem to scientists of NMFS' Exploratory Fishing and Gear Research Base in Pascagoula, Miss. They use RUFAS (Remote Underwater Fishery Assessment System), which "flies" just over the scallop beds. Base engineers and the electronics industry developed it.

RUFAS

RUFAS is a towed vehicle with an optical system capable of looking at the seabed, according to engineer Wilber Seidel. It is connected by electrical cable to the vessel, which tows it and also serves as remote control center. The operator, or pilot, can maneuver RUFAS to any position over the seabed from the control center. Electric motors turn maneuvering vanes on the vehicle. Special sensing devices determine its height above seabed and look ahead for uncharted obstructions.

Optical System

The optical system consists of special lights, television, and 35 mm. motion-picture cameras. It is electrically operated from the control center. When RUFAS is looking at the seabed, the TV monitor and video-tape recorder also give scientists a continuous high-quality picture of the terrain. The motion picture camera is turned on when the scientists want to record biological phenomena.

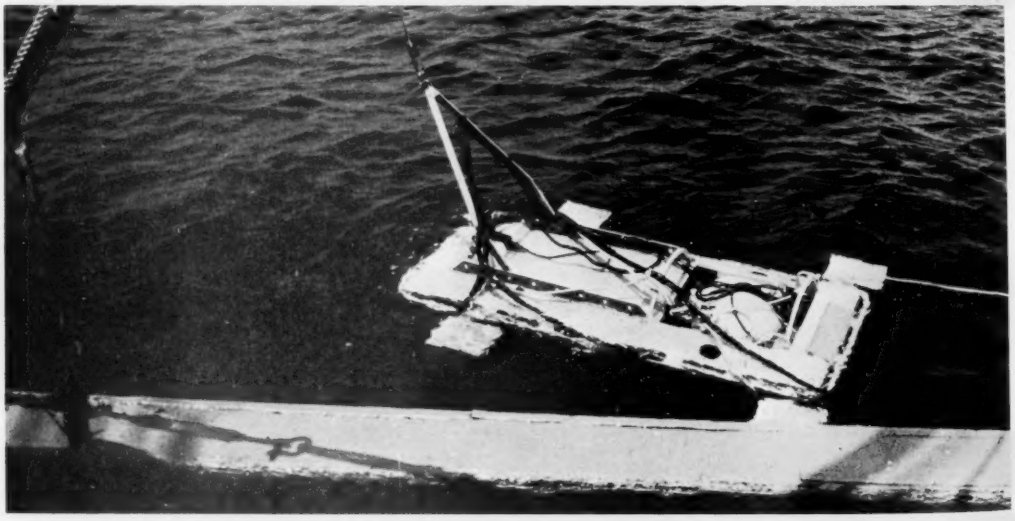
Vast Scallop Beds

The calico scallop beds off the north Florida coast are extensive. NMFS scientists and the fishing industry predict an annual catch of 15-20 million pounds as early as 1975. With wholesale price over $1 per pound, this new fishery would be very valuable.

During a recent RUFAS survey, 120 miles of the scallop beds were viewed, and 4,500 feet of 35 mm. color film were exposed, plus 23 hours of video tape.

RUFAS has provided timely information to commercial fishermen about the location and abundance of calico scallops. It has provided scientists valuable knowledge about growth rates, spawning, and density--all vital to proper management of this developing fishery.

The current RUFAS is not designed for the extreme pressures of deep water, though it has surveyed to 35 fathoms. A more sophisticated model is on the drawing boards. It will have greater depth capability, broader seeing range, and contribute to NMFS' new program to monitor and assess more living marine resources.



RUFAS (remote underwater fisheries assessment system). (Photo: J. B. Rivers)

GULF SCIENTISTS STUDY BENEFITS OF DATA-BUOY NETWORK

A study to determine public and economic benefits from a data buoy network in the Gulf of Mexico is underway within the Gulf Universities Research Corp. (GURC). Scheduled to be completed by April 1971, the study will provide criteria for design and deployment of the network to get the most use out of it. Contract for the study is with the U.S. Coast Guard.

GURC has encouraged initial deployment of the National Data Buoy System in the Gulf as a first priority for scientific and practical reasons, according to Dr. James M. Sharp, GURC president.

He stated: "A better understanding of the climatology and dynamic processes of the waters and air masses in the Gulf of Mexico is an objective of long standing in Gulf coast universities. In addition to the Gulf's being an excellent natural laboratory for oceanographic and meteorological phenomena study, a better means of describing and predicting physical processes in the Gulf can help solve many problems of public and economic interest."

Benefits of Network

Dr. Sharp said improved forecasting of storms and hurricanes would strengthen coastal protection. Improved forecasting of surface conditions and currents for fishing, offshore service, coastal transportation, and pleasure craft would be another benefit.

He emphasized that moisture crossing the Gulf shoreline provides most of the rainfall for the central and eastern U.S. It creates ground fog affecting coastal air traffic.

What Is Needed

To develop climatological understanding--and knowledge of dynamic processes needed for accurate description and prediction of Gulf ocean and atmospheric weather--requires a way to report oceanographic and meteorological measurements from the Gulf.

Dr. Sharp emphasized: "Both air and water traffic in the Gulf are limited so that reports from these sources are meager, especially when weather and sea state conditions are severe.

"Weather satellites and long range radar have improved coastal protection and weather prediction but, as Camille, Celia and unnamed but sudden destructive tropical storms in the Gulf have shown, there is still room for improvement."

Dr. Sharp said this improvement can come only when the Environmental Sciences Services Administration (ESSA) Gulf system and scientists have this information available to develop the understanding of processes that leads to accurate prediction.

Data On Other Oceans Needed

Dr. Sharp stated that there is similar need for data from other oceans. Many Federal and state agencies, and the transportation, fishing, and mineral extraction industries operating in the ocean areas need improved description, as well as prediction, of physical processes.

Coast Guard's Role

The U.S. Coast Guard has conducted studies of "requirements, design and economics of obtaining data from ocean areas by means of instrumented buoys." These studies included comparison of data buoys with other observational means--satellites, aircraft, ships, platforms, etc.

The Coast Guard plans development of prototypes of data buoys for acquiring ocean data. Engineering tests and evaluation buoys are scheduled to be deployed in the Gulf within the next year. Operational buoy network to cover limited ocean areas will be available within a few years.

PACIFIC SAURY: Fishery Studied from Vessel & Plane

I. 'JOHN N. COBB' LOCATES SCHOOLS & EVALUATES HARVESTING SYSTEMS

The John N. Cobb returned to Seattle, Wash., on September 10 after an 18-day cruise in Puget Sound and Washington-Oregon coastal waters to test methods of harvesting Pacific saury (Cololabis saira). The vessel serves the Exploratory Fishing & Gear Research Base of the National Marine Fisheries Service.

The principal cruise objective was to locate concentrations of Pacific saury and to evaluate the commercial potential of three prospective harvesting systems--fish pump, purse seine, and lampara seine--used along with a light-attraction system.

GEAR

Lighting System: The light array consisted of 11 light booms 16 to 30 feet long, each carrying a 2,000-watt bank of incandescent lights. Two booms were 12 feet apart on the stern; the others were at about 15-foot intervals along portside and along starboard-side from bow to after end of house. Two portside booms in the seine-pursing area and the two stern booms in lampara hauling area had a 1,000-watt quartz-iodide light with a red filter. These lights were switched on and off from a low-voltage, remote-control box with a 100-foot cord, usable anywhere on the

Fig. 1 - Saury jumping wildly alongside the Cobb when the white lights are first turned on.

vessel. A 5-kw. searchlight was used to detect surface concentrations of saury and to "draw" them to vessel.

Seining System: The net was $\frac{3}{4}$-inch stretched mesh, 6-thread knotted nylon, 4,500 meshes long by 1,500 meshes deep. The length of corkline was 150 feet, leadline 144 feet, and breastlines 24 feet. One hundred-fathom $\frac{3}{4}$-inch braided towlines were attached to each end of corkline.

There was no chance to test two 150-fathom lampara seines.

Fish Pumping System: The fish-pumping system consisted of a collecting funnel, submersible pump, discharge hose, and fish/water separator. The funnel was canvaslike material supported by 8-foot aluminum frame. It was floated alongside starboard-side. The hydraulic-powered submersible pump was bolted to funnel frame and discharged through a flexible 10-inch hose. The hose passed aft around stern, where it was connected to a steel 10-inch pipe at rail on portside of stern. This pipe discharged into a fish-sorting table with a bed of gradually diverging stainless-steel rods. The water passed through this, fell to the deck and flowed out through scuppers.

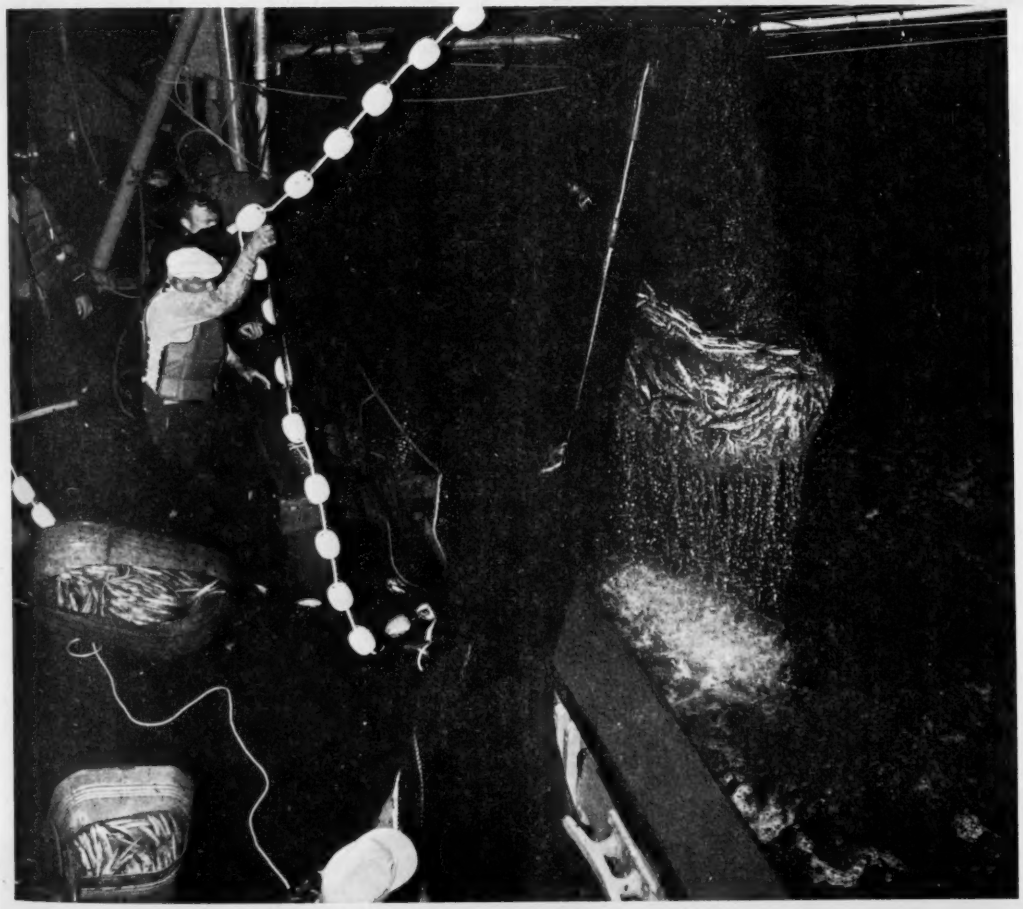


Fig. 2 - 800 lbs. of saury caught in 150-foot seine being strapped aboard Cobb.

METHODS OF OPERATION

During first two cruise days, work was conducted in Puget Sound to develop handling techniques and to make diver measurements on saury seine.

Searching and fishing for saury were conducted off Washington-Oregon during darkness. Search patterns, run in north-south zig-zag fashion, were restricted to waters ranging from 57° to 61.5° F. Saury were detected primarily by scanning spotlight over surface. Several banks of alluring lights were also lighted during scouting. When saury were located, the main engine was stopped. Saury were concentrated around vessel with the banks of alluring lights, and by sweeping spotlight from fish to vessel.

When working the fish-pumping system, fish were concentrated under the bow alluring lights. The pump and funnel were set off the starboardside aft, and the pump was turned on. Then, fish were moved about 60 feet along starboardside to area in which pump was located by turning on and off, in sequence, banks of lights along side of vessel. A 450-watt underwater thalium-iodide light with a red filter was located inside funnel next to pump intake.

The purse-seine-type net was set from Cobb's stern and operated without using a skiff. When a large school was accumulated alongside, the vessel was run in a circle. A buoy was dropped and a 100-fathom towline paid out. The net was set from stern on windward side of circle. The other 100-fathom towline was laid out while returning to

Fig. 3 - Saury caught by Cobb in first offshore set of 150-ft. saury seine.

retrieve the buoy. Then the lines were hauled and the seine dried up and brailed. The corkline was held up and out away from vessel during brailing by 3 cylindrical plastic floats on corkline--and by a line snapped on corkline running out over a block on light boom just ahead of purse davit. All light banks were on while setting and while hauling most towlines. As net neared the vessel, all lights were turned off, except 2 banks near center of net.

RESULTS

Operations in coastal waters were limited to 9 nights; 600 linear nautical miles were surveyed, extending from 44 to 86 miles offshore. Sixty percent of available search time was spent off Washington. Most foul weather was encountered off Oregon; efforts there were limited to northern and central Oregon.

Location, Surface-Water Temperature, and Saury-Catch Data for Stations Occupied During John N. Cobb Cruise No. 70-9

Date	Station	Position		Surface Water Temperature	Time Stations Were Occupied	Estimated Quantity of Saury Observed	Gear Type	Catch	Fork Length cm.	
		Lat. N.	Long. W.		Minutes	Tons		Lbs.	Mean	Range
8/28/70	1	47°12'	126°27'	60°	90	3-5	Pump	1	27	27>
9/01/70	2	45°03'	125°50'	58°	90	7-9	Seine	800	26	19-30
9/02/70	3	44°34'	125°12'	58°	30	2-3	Pump	-	-	-
9/02/70	4	44°33'	125°11'	58°	60	3-5	Seine	400	26	18-30
9/03/70	5	44°30'	125°08'	58°	60	6-8	Seine	300	26	18-30
9/03/70	6	44°34'	125°04'	58°	120*	7-9	Pump	100	27	25-31

*Actual pumping operations were limited to 10 minutes.

Sizable concentrations of saury were located on 3 of 9 operative nights, one night in Washington waters, and two nights in Oregon waters. Results of the 6 fishing attempts (3 pump stations and 3 seine stations) are summarized in table. At stations 1 and 2, saury concentrations were not located until about 0330 P.s.t.; so working time was limited to about 90 minutes before daylight.

Pumping Experiments: The pump was fished at stations 1, 3, and 6. The fish hose was blown off pump at stations 1 and 3, which limited pumping operations to about 2 minutes and 4 to 5 seconds, respectively. In each case, the lengthy repairs required temporary halts. Station 6 was the only time when pump operated without mechanical problems. However, on this occasion, rough weather hampered operation, and the pump funnel could not be oriented at proper distance from vessel. Only a few of the available fish passed into the funnel as they were led along side of vessel. Fish that entered funnel were pumped aboard readily. Lighting techniques used to "run" school along vessel to pumping position were very successful.

Seining Experiments: During first 2 days of work on Puget Sound, the purse seine was rigged and handling techniques developed during 4 test sets. Diver observations during the last 2 sets indicated the net configuration during hauling was satisfactory. However, when set offshore, the net did not always perform as in Puget Sound. About 80% of available fish were encircled by net. Most of the catch was lost around breastline or over corkline at station 2 due to foulups and inadequate rigging. At stations 4 and 5, with a 20- to 25-knot wind blowing, the leadline was so light that the net passed above most fish. Chain was added and tom weights obtained to keep gear down, but lack of fish did not allow gear to be tested again.

The use of lights for seining was successful. As vessel got underway and began paying out towline, the fish initially would stay with boat. Later, they began dropping away until only a few remained with boat by time seine set was two-thirds completed. Most, if not all, of the fish, were regrouped, however, during 10 to 15 minutes required to pull net to vessel's side. As net neared vessel, all fish were relocated to pursing area and successfully held in that position as enclosure was completed.

II. SAURY SCHOOLS SPOTTED FROM AIRCRAFT

Numerous schools of Pacific saury were sighted from a Coast Guard aircraft on September 24. The schools were detected visually at night by their reflected bioluminescence. Identification of the fish as saury was based on a previous overflight, when "sea truth" data were provided by simultaneous catches obtained from the John N. Cobb.

As observed on an earlier flight, the saury schools characteristically were about as large as a house and irregularly shaped. Within the region surveyed from off Cape Flattery, Washington, to the California-Oregon border, the saury were sighted in two areas 30 to 60 miles offshore.

The first area was in an 85-mile band extending from west of Cape Flattery to west of Cape Elizabeth, Washington.

The second area was in an 80-90-mile band between Cape Arago, Oregon, and Crescent City, California. Saury schools were still being sighted off Crescent City when daylight terminated operations.

Where "heavy concentrations" of saury were seen, the schools typically were about 50-100 yards apart, with 25 or more schools within a $1\frac{1}{2}$-mile band of water. Heaviest concentrations were at the survey's northern end (west of Cape Flattery). There, within a 5-mile area, three almost-continuous bands of fish, each about 800 to 1,200 feet long and 600 to 800 feet wide, were observed.

No Japanese saury vessels were sighted. This suggests fleet may be working to the north, off British Columbia.

A.T. Pruter, Seattle Base Director, states: "Aircraft spotting appears to be a very effective way to locate schools of saury and may be necessary if we are to have a U.S. fishery."

Spotting aircraft would aid U.S. fishermen--and be unavailable to foreign fishermen.

For further information contact: A.T. Pruter, Base Director, Exploratory Fishing and Gear Research Base, National Marine Fisheries Service, 2725 Montlake Blvd. East, Seattle, Washington 98102 (Phone: 583-7729).

COMMERCIAL GEODUCK-CLAM FISHERY UNDERWAY IN NORTHWEST

Washington State's newest commercial fishery--for geoduck clams--is underway. Catches of 8,506 pounds were reported by Washington Department of Fisheries, as of Aug. 30, 1970.

Most of the clams are going to restaurants. Some restaurants are featuring a crown steak from the big clam, which they call a "king clam."

ROCKFISH HAVE STRONG HOMING ABILITY

Last year, Richard Carlson and Richard Haight, biologists at the NMFS Auke Bay (Alaska) Biological Laboratory, discovered that yellowtail rockfish, Sebastes flavidus, possess a well-developed homing ability. They tagged and released in Auke Bay 35 fish held in captivity for 3 months at the laboratory. Within days, the fish migrated the 5 miles back to the place where they were captured originally.

SCUBA surveillance of the rockfish population at the home site showed that this shallow-water species descended into deeper water during winter, but returned to the same home site in spring.

Harder Tests for Rockfish

This year, the biologists tested the strength of this homing ability by releasing fish at sites intended to present varying degrees of difficulty: forcing the fish to cross over deep water, placing them in other channels influenced by different water conditions and currents, placing them north and south of their home site, and forcing them to pass through other yellowtail populations.

In each case, the fish returned home, either within days or within a few weeks. So far, the releases have been between 5 and 7 miles distant from the home site. The next step in the experiment will be to see how far these fish will migrate in their effort to return home.

NMFS RESEARCH VESSELS EXPLORE FOR SKIPJACK TUNA

Two research vessels of the U.S. Department of Commerce are exploring an area on the equator, about 2,000 miles south of San Diego, for skipjack tuna.

The EASTROPAC expeditions of 1967 and 1968, sponsored by the National Marine Fisheries Service (NMFS), indicated there is "a likely region for concentrations of skipjack," said Dr. Alan R. Longhurst, Director of the NMFS La Jolla, Calif., laboratory.

The two vessels are the 'David Starr Jordan' operated by the NMFS La Jolla laboratory, the 'Townsend Cromwell' by the NMFS laboratory in Honolulu.

Fig. 1 - David Starr Jordan.

NMFS is part of the Commerce Department's new National Oceanic and Atmospheric Administration (NOAA).

Cromwell sailed from San Diego Oct. 28 and is slated to return Dec. 1; Jordan left Nov. 2 and will return to San Diego on Dec. 17.

Yellowfin & Skipjack Main Species

Yellowfin and skipjack tunas are the two main species caught by U. S.-flag vessels, many based in San Diego and San Pedro. The tropical yellowfin-tuna fishery is regulated by an annual catch quota. So the Nation's largest high-seas fishing fleet has a serious problem finding alternate tuna resources. Some boats can turn to the late-summer temperate tuna fisheries, some to the eastern tropical Atlantic. But the most important alternative, say fishery biologists, is the stock of oceanic skipjack in the eastern Pacific--unregulated and underfished.

Expedition's Object

The expedition's object, said Dr. Longhurst, is to learn if skipjack tuna are abun-

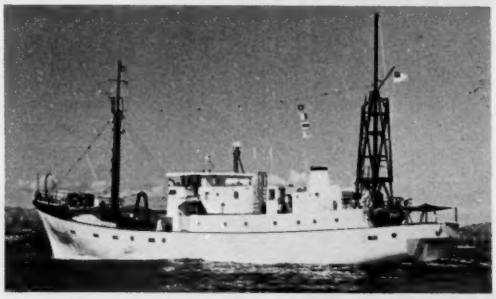


Fig. 2 - Townsend Cromwell.

dant under fishable conditions in this area. Cromwell is making a rapid north-south survey, measuring temperatures, salinity, oxygen, surface chlorophyll, and other oceanographic features. The information is radioed to Jordan. Both ships then proceed to investigate with electronic fish-finding apparatus, mastman, and trolling gear the occurrence of skipjack in likely places.

One scientist watches for birds and porpoises often associated with tuna.

SPACE-AGE TECHNOLOGY USED TO FIND FISH

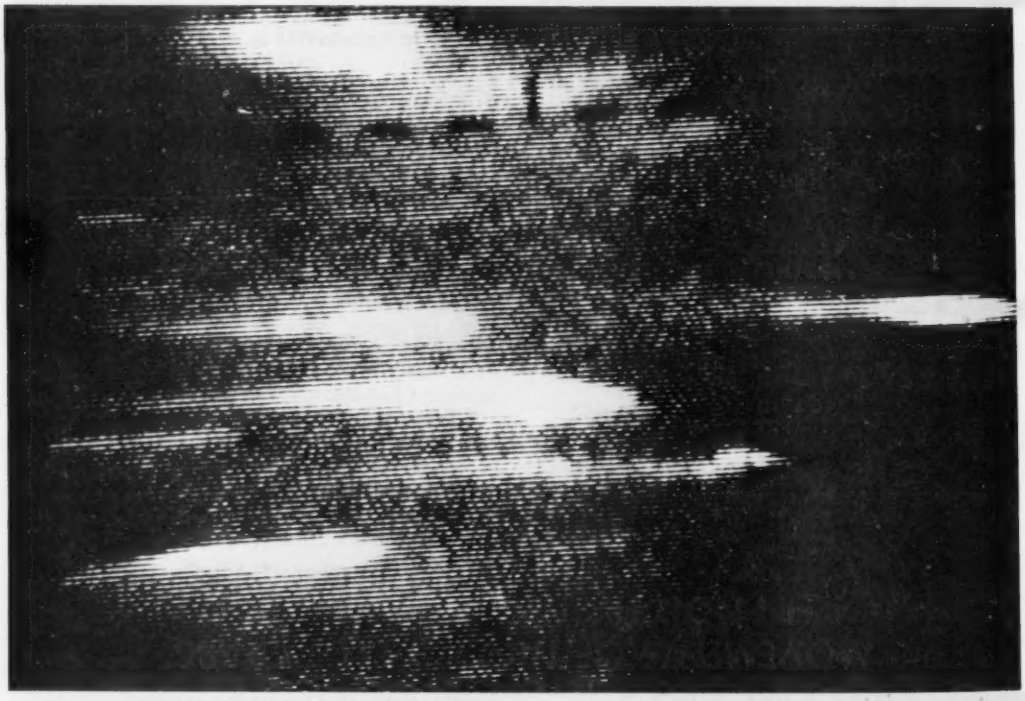
The National Marine Fisheries Service (NMFS) plans to move some personnel to NASA's Mississippi test facility to use its sophisticated technical equipment. This will allow NMFS to expand its Remote Sensor technology program, says William Stevenson, who will be in charge. Historically, locating and assessing fish stocks have taken place from slow-moving ships covering very little ocean surface. In some fisheries, up to 85% of vessel-operating time is spent finding fish. New technology in remote sensing may revolutionize detection, identification, and censusing of open-sea fishery resources.

The Equipment Used

Recent studies at NMFS' Exploratory Fishing and Gear Research Base in Pascagoula, Miss., have shown that airborne sensors can be used to locate and identify surface and near-surface fish schools.

Using aerial photography and special films and cameras, scientists have found that they can locate and identify fish schools. Identification is based on differences in color or spectral reflectance. Observations were made of 15 commercially important species. Measurements were made on single specimens, on groups, and on schools inside impoundments. The results showed different species reflected different color spectrums; these could be used for identification.

With multispectral photographic system and spectroradiometers, NMFS scientists penetrated the water optically, detected the presence of fish schools, and measured the color pattern or spectral reflectance.



Spanish mackerel swimming at night create a "fire" in the water. The "fire" is caused by tiny organisms that glow when disturbed by swimming fish. NMFS scientists use image intensifiers to amplify this light 40,000 times or more. They believe that these devices can be used from aircraft to help fishermen find and identify schools of fish.

Oil Slicks Useful

Preliminary tests indicate that oil slicks from large fish schools, such as menhaden, can be detected and used to locate and identify these schools. Fish-oil slicks also have different temperatures than the surrounding sea surface. So the presence of fish can be detected by monitoring sea-surface temperatures.

Image Intensifiers

The Pascagoula Base has explored another approach to finding and identifying open-sea fish stocks. This uses low-level light sensors, such as image intensifiers, coupled to closed-circuit TV to detect bioluminescence, or "fire" as fishermen call it, associated with schools of fish. Florida fishermen use "fire" to find Spanish mackerel at night. This "fire" results from movement of fish schools, which cause luminescent organisms to glow momentarily. The bodies of rapidly swimming fish are outlined with lights; each leaves a trail of fire as it moves.

The image intensifiers amplify surrounding light 40,000 to 100,000 times. Scientists have been able to observe thread herring schools at night from altitudes of 500 to 5,000 feet.

Preliminary tests suggest that low-level light sensors may be used effectively from high altitudes to locate and possibly identify open-sea fish schools over large areas.

Value to Commercial Fishermen

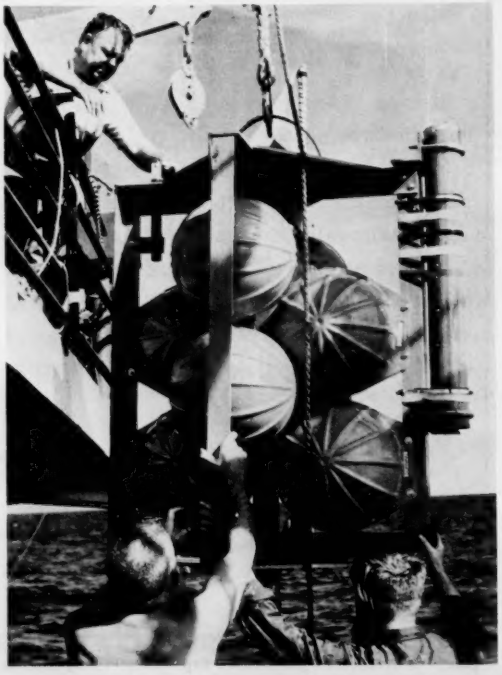
The Pascagoula research may lead to a system that will sharply reduce the time commercial fishermen spend looking for fish. Such information will permit development of underutilized fishery resources, which now cannot be harvested economically because of search time and other factors. Scientists will have tools to tell them quickly whether fishermen can harvest a resource--and how much they can harvest without depleting it.

MODULAR BUOY SYSTEM

Scientists at Woods Hole Oceanographic Institution (Mass.) prepare (below) to lower into the ocean a modular buoy system composed of glass spheres bolted to a fiberglass frame-work. Four such buoys and associated equipment were deployed by Woods Hole to depths of 4,500 meters for 2-month periods in a study of Gulf Stream currents. Each unit stands 67 inches high and provides 340 pounds of buoyancy.

Each mooring included a magnetic tape current meter, an acoustic release holding an 800-pound anchor, and the buoy for returning the package to the surface.

Called Cablemates, the 16-inch glass spheres and cases are manufactured by Corning Glass Works. They are designed for simple attachment to equipment such as the buoy rack. The amount of buoyancy is changed by adding or removing individual Cablemate units.



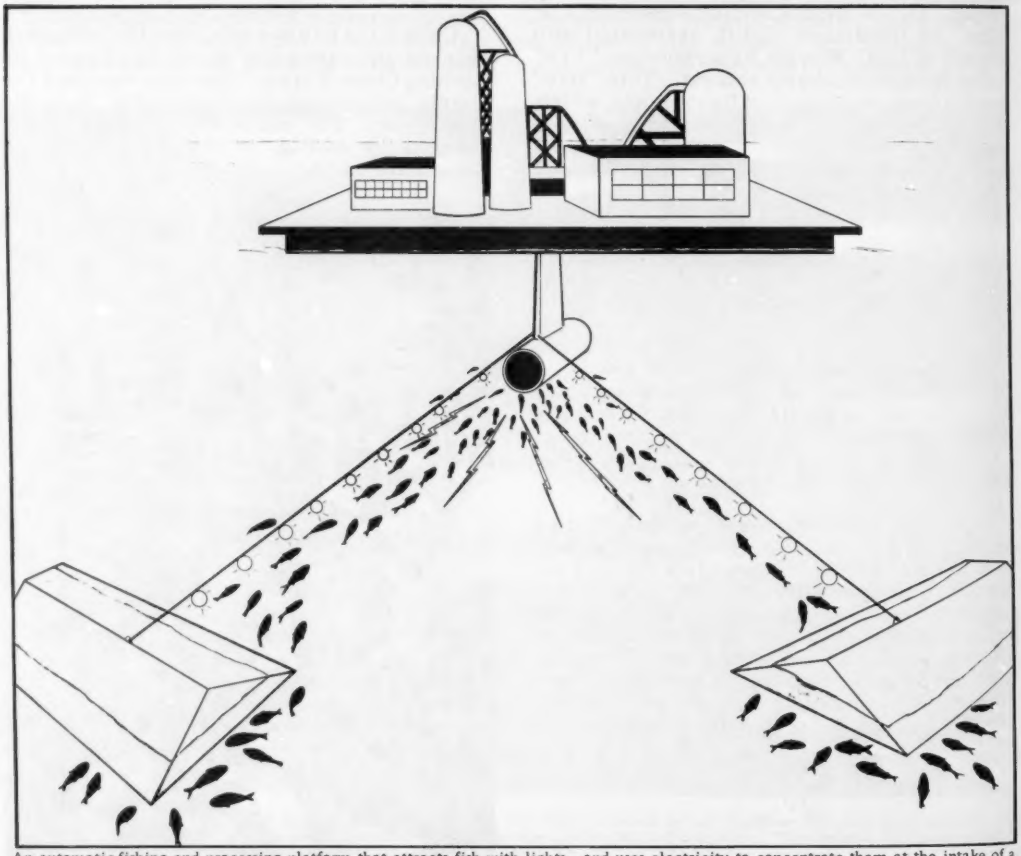
A FISHING PLATFORM MAY SOME DAY REPLACE TODAY'S GEAR

The commercial fisherman is still the hunter of the seas. Despite modern technology, he fishes much the same way his precursors fished--with nets, traps, lines, or similar types of gear.

The NMFS Exploratory Fishing and Gear Research Base in Pascagoula, Miss., is trying to change this ancient approach to fishing. It is developing an automatic fishing platform that may be in operation in 1971. The large latent potential of the Gulf of Mexico is one reason for the development of the platform.

The Fishing Platform

The purpose of the fishing platform is to attract small, loosely schooled fish with submerged rafts and to guide the fish with special lighting to a central point. There they can be concentrated with an electrical field and



An automatic fishing and processing platform that attracts fish with lights--and uses electricity to concentrate them at the intake of a pump--is being developed at NMFS Exploratory Fishing and Gear Research Base, Pascagoula, Miss. The fish can be processed automatically aboard the platform for human or animal food.

pumped aboard a floating platform. The fish could be automatically processed for human and animal food.

The principles behind the platform are not new. SCUBA divers in the northern Gulf of Mexico have observed the small submerged rafts attract and concentrate fish. The rafts, which resemble small tents, attract two types of fish: the "jacks"--amberjack, blue runner, and rainbow runner; the "baitfish" associated more loosely with the structures, and consisting of Spanish sardine, scaled sardine, and round scad. Daily observations showed that over 100,000 baitfish were attracted to each structure. Studies at Pascagoula will determine the best shape and size of the submerged rafts for attracting fish.

Lights to Concentrate Fish

Lights have been used for many years to concentrate fish for commercial fishing. Herrings, anchovies, jacks, squids, and some mackerellike fishes have been concentrated in large quantities around surface and subsurface lights. These fish generally are small and are distributed in small schools along most Gulf and Atlantic coastal areas.

Using underwater mercury vapor lights, the scientists were able to concentrate and catch up to 3 tons per set of these fishes. Commercial purse seining around these lights was economically feasible, but catches were about one-third lower during full-moon periods than during new moon. Studies continue to evaluate the correct type and amount of light for attracting and controlling these fishes.

Early as 1966, submerged lights attached to a fish pump were used to sample open-sea fishes in the Caribbean. Although catch rates sometimes reached 900 to 1,800 fish pumped per minute, the fish were not concentrated sufficiently to make this process commercially feasible. The scientists believe that electricity will concentrate even more fish at the intake.

Electronics Used

Laboratory studies using modern electronics show that specific types of pulsed DC can effectively lead and concentrate fishes. Research will evaluate and determine the best kind and amount of electricity to attract and lead fishes. The results will be used in field tests of the commercial harvesting system utilizing light, electricity, and pumps.

NEW RESEARCH ON FISH-FLESH OIL OXIDATION

Only one method has been completely successful so far in stopping all oxidation of oil in the flesh of fish: keeping all air away by hermetically sealing fish in metal containers. Several series of silver (coho) salmon have been kept frozen in cans for years with no measurable rancidity developing.

In summer 1970, for the first time, pink salmon was frozen in cases to be tested. The oil in pink salmon oxidizes more rapidly than in any other species of fish, but samples examined at the end of August showed no discoloration or rancidity. The fish had been stored frozen for one year.

A New Variable Tried

Now NMFS' Pioneer Research Laboratory in Seattle is trying a new variable in an effort to reduce the cost of processing fish in cans for freezing to a practical level. Samples of sockeye salmon were packed exactly as for canning by being put through a commercial automated salmon-canning line. Then they were withdrawn just before they would have gone to the retort, and were frozen.

This method of packing eliminates hand labor, but it results in two possible disadvantages: Bone is left in the fish. And, because of greater head space in machine-packed fish, there is possibility that small residual amount of air left after vacuum seaming might be sufficient to cause oxidation.

The initial examination of fish packed in this way was favorable. The fish had a pleasing appearance in the can; after thawing and cooking, the color was brighter than that of sockeye from the same batch of fish that had been canned (retorted) in usual way.

PICKLED THREAD HERRING SERVED AS SNACKS

Over last several years, I have been experimenting with new methods of utilizing various fish and shellfish in Puerto Rico which are not presently utilized, or not fully utilized. One of them is thread herring (Opisthonema oglinum). So far, it is used only for fish oil and meal productions in the Atlantic and Gulf coasts, but I found that excellent-quality picked-herring can be made from the thread herring which are over five inches in length. The fish can be chocked and salted or fileted, salted, and pickled exactly the same way as pickling the herrings on the east and west coasts. They can also be salted and smoked. I believe the thread herring in the Pacific Ocean (Opisthonema libertate) which are found in abundance in the Gulf of Panama can also be utilized in the same way.

Little Snacks

New Industry Possible

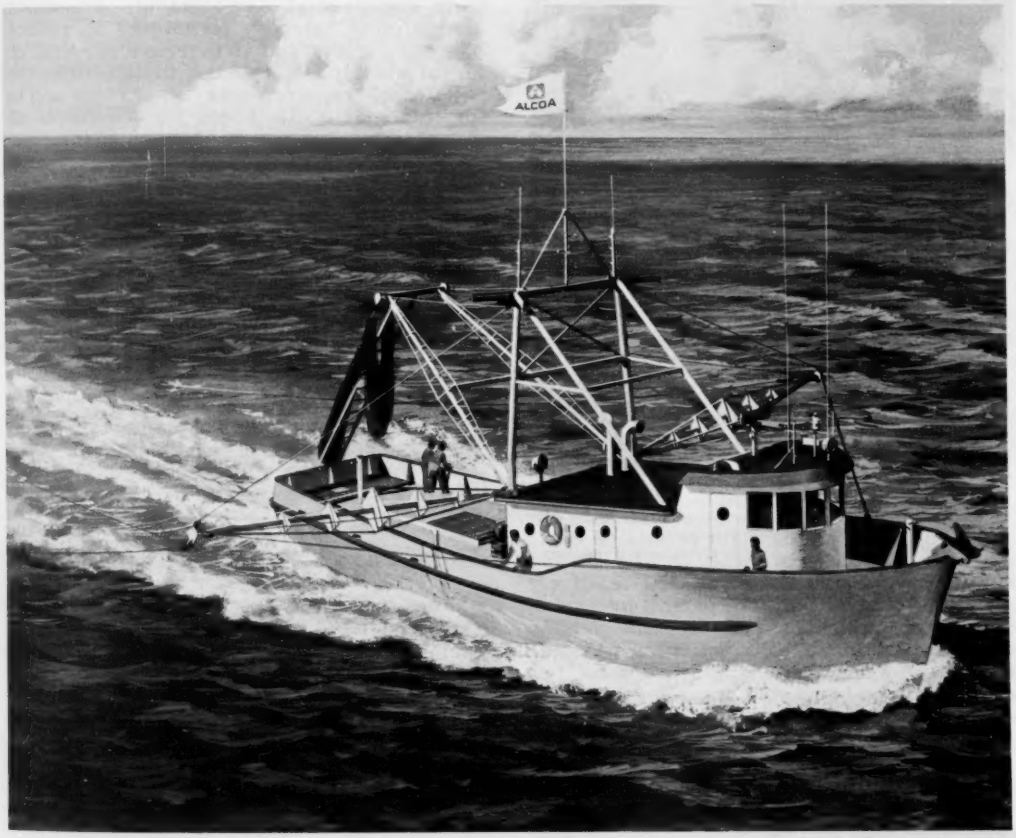
In Puerto Rico, thread herring are caught by beach seines and gill nets as incidental to catch and are not actively sought after. Large schools of them can be sighted throughout the year around the islands, and a large number of them can be captured by $2\frac{1}{2}$-inch mesh gill nets. Thus, it is possible to establish a new industry which processes thread herring for local, states and Caribbean markets.

--Robert Y. Ting
Associate Professor
University of Puerto Rico

NEW ALUMINUM SHRIMP TRAWLER

A new shrimp-trawler design is available from Alcoa. The 76-foot design specifies aluminum for major components, including hull, deckhouse, rigging, and fish hold liner and shrimp stowage system. The beam is $23\frac{1}{2}$ feet and draft 9 feet.

Among aluminum innovations are new welding specifications, improved alloys, and a penboard and stanchion system for storing just-caught shrimp. Drawings and bill of materials are available from Alcoa, 1501 Alcoa Building, Pittsburgh, Pa. 15219.



New aluminum shrimp trawler.

SHRIMP FARMING MAY HELP MEET GROWING CONSUMER DEMAND

Scientists at the NMFS Biological Laboratory in Galveston, Texas, believe that shrimp farming (mariculture) may be the answer to the growing demand for shrimp. At present, Americans eat about one million pounds a day--about one-third world production.

The Galveston scientists collect live female shrimp in spawning condition, spawn them in the laboratory, hatch the eggs, and rear the larvae.

Female shrimp are collected in the Gulf of Mexico and transported to the laboratory. Each female carries 500,000 to 1,000,000 eggs. The eggs hatch in about 12 hours--provided conditions are suitable. The small shrimp, called larvae, are fed small algae (diatoms) and brine shrimp.

After two weeks, the young shrimp are transferred to brackish-water ponds. There they will grow to about 4 inches with natural foods. Growth can be spurred by adding fertilizers or feed to the ponds. However, growth diminishes as shrimp approach size ($3\frac{1}{2}$-$4\frac{1}{2}$ inches) at which they normally leave estuaries and move offshore.

Live Bait Market

Cornelius Mock, in charge of hatchery engineering, believes the first profitable commercial operations probably will be shrimp culture for live bait markets. The relatively high price paid for bait will permit profitable production of small shrimp in ponds despite the unavailability of efficient culture techniques. Under normal weather conditions, two crops could be harvested annually.

The Problems

Several problems have prevented development of shrimp farming for food market, says Mock: (1) the high cost of obtaining young shrimp for stocking (2) no efficient foods are available, and (3) the low price per pound for shrimp of small sizes that can be raised in ponds.

Despite these problems, several private companies have built hatcheries for growing and selling young shrimp. Many companies and universities are researching shrimp culture.

Galveston Research

The Galveston research will aid long-term commercial development. Scientists are refining hatchery techniques to reduce operating costs and to increase survival of larval shrimp. They hope to determine the nutritional requirements of shrimp and to formulate artificial foods for shrimp of all sizes. They must also develop methods to hold shrimp throughout their entire life cycle. Once these methods are developed, selective breeding will begin.

Recently, the researchers freeze-dried the diatoms used to raise larval shrimp. Later, the diatoms were mixed with sea water and fed to larval shrimp. The results were good. This technique may permit the storage of food. It also may make raising young shrimp more flexible and less dependent on the timely success of diatom cultures.

They also have tried supplemental feeding to accelerate growth of larger shrimp. Pelleted rabbit and trout foods and corn meal have been tested; so far, little or no growth has occurred.

Next Steps

Because of recent developments at the Galveston Laboratory, scientists may soon attempt to increase local shrimp stocks by seeding natural populations. Stocking artificially reared shrimp in natural waters may be desirable where production is poor because of adverse environmental conditions. Techniques have been developed to rear large numbers of shrimp from eggs deposited in the laboratory to about $\frac{1}{2}$-inch long, a suitable size for stocking. With present facilities, about one million shrimp can be produced each year. Expansion of hatchery facilities will permit production of more small shrimp. It will enable scientists to determine feasibility of supplementing wild populations by seeding.

GETTING MORE MEAT FROM FISH

Doubling the yield from fishery resources--without catching more--may sound like a dream, but NMFS scientists are working to make it a reality. They are using special processing machines to recover almost twice as much meat from fish as present techniques produce. Many species--rockfish, flounders, haddock, cod, and others--are filleted. The normal yield of meat from each fish ranges from 25 to 30%.

At the NMFS Technology Laboratory in Seattle, Wash., scientists using the new machines have obtained meat yields of 37 to 60%.

These machines have been used in Japan since the early 1950s to prepare boneless and skinless flesh from dressed fish, fillets, and chunks of flesh from large fish. The Seattle scientists learned of the machines in 1968 during the visit of a Japanese scientist. The NMFS Technology Laboratory in Gloucester, Mass., also obtained a similar machine to study Atlantic Coast species.

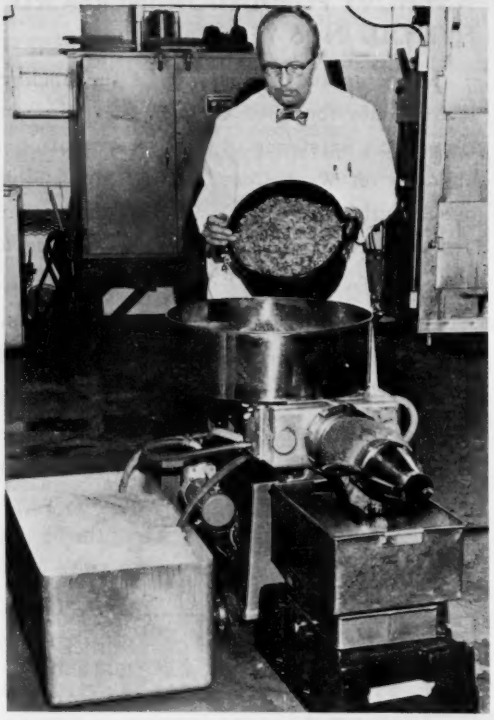
The Machine

Headed and eviscerated fish are fed into the machine and pass between a belt and a perforated drum. The pressure applied by the belt on the fish forces the flesh through the drum perforations, while the skin and bones pass to the waste discharge chute. The fish flesh can be passed through a meat strainer to remove any traces of bone. The final product is minced fish, free of bones and skin.

The Seattle scientists have used the minced fish to develop foods that no longer resemble fish. These foods can be flavored and modified to taste like cheese, spiced meats, or other items. The Gloucester scientists are using the minced fish in new products: fish cakes, canned fish, and fish frankfurts. They used the minced fish as a starting material in fresh fish sausage, croquettes, casseroles, fish loaf, and jellied roll.

Potential Value

The potential value to the New England fishing industry was shown by Gloucester scientists. In 1967, 312 million pounds of New England fish were filleted. They estimated that about 126 million pounds of meat were recovered. Had the wastes been run through the Japanese flesh separator, another 57 million pounds might have been recovered. At 10¢ a pound, this would have been worth $5.7 million.



A final process in preparing minced fish is to pass it through a meat strainer to remove any remaining bones. This machine helps NMFS technologists recover large amounts of fish flesh that previously were discarded. Minced fish has been used by NMFS technologists on both coasts to develop new foods--such as fish cakes, fish frankfurts, and canned minced fish. These new methods will increase the use of fishery resources and help develop new markets.

This new technology could help U.S. fishing industry produce the fast-growing, processed, high-protein snack-type and convenience foods using the long-neglected species as protein source. Successful introduction of fish protein into only one or two of these high-volume food products could create a new demand for exploiting the underutilized fishery resources.

ANCHOVY POPULATION INCREASED FIVEFOLD IN 16 YEARS

An extensive reanalysis of the anchovy larvae data for 1951 through 1966 has confirmed the existence of a large population of anchovy off West Coast. The increase has been on the order of fivefold (figure). This was reported by NMFS' Fishery-Oceanography Center, La Jolla, Calif.

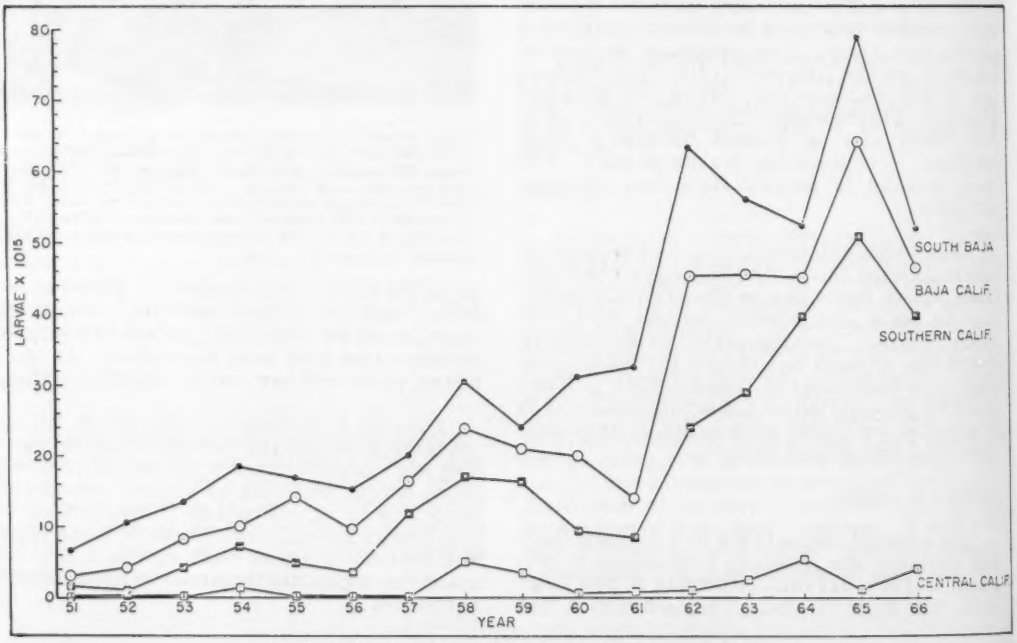
Most of the increase was noted off southern California, especially 80 to 280 miles off coast.

Work is now in progress to define more closely the estimates of spawning biomass through direct estimation of anchovy spawning biomass from anchovy eggs; these eggs have been collected with new nets since 1966.

STAMINA OF HATCHERY-REARED FISH TESTED

A see-through plexiglass tunnel--a "stamina tunnel"--is being used in fish hatcheries of the U.S. Department of Interior's Bureau of Sport Fisheries and Wildlife to test the stamina of fish. The tunnel will help determine their ability to survive after being planted in natural waters.

The tunnel carries a stream of water of controllable velocity. It is being used to see if fish are able to maintain their normal position against a natural flow of water.



Numbers of anchovy larvae off the Pacific West Coast, 1951-66.

OYSTERS CAN BE GROWN SUCCESSFULLY IN MSX-INFESTED AREAS

Oysters can be grown successfully in areas infested with the microscopic parasite MSX, reports Dr. Jay D. Andrews, Virginia Institute of Marine Science (VIMS). The problem is getting commercial quantities of resistant seed oysters. A VIMS unit is conducting research aimed at rearing disease-resistant oysters to rehabilitate abandoned oyster grounds in lower Chesapeake Bay.

Native and selected laboratory-bred offspring have been reared from spatfall to market size without intolerable losses, Dr. Andrews said. Predation, winter smothering, and storm damage remain important causes of mortality.

Resistance to MSX

Offspring of oysters native to lower Chesapeake Bay have exhibited resistance to prevailing levels of MSX activity in 7 consecutive year-classes from 1964 through 1970, Dr. Andrews reported. Fewer than 20% per year of these year-classes have died. This excludes losses from smothering and predation.

Resistant Seed Oysters

Use of areas where MSX is active requires resistant seed oysters. These may be obtained in two ways: 1) Brood oysters heavily selected by MSX for several years may be bred in hatcheries--and thus produce genetically resistant seed. The hatchery method has not yet been proved economically feasible, and the quantity of seed needed is too large for hatcheries. 2) "Obtain seed with acquired resistance gained by exposure to MSX from egg and larval stages to seed size. The parents of these natural sets in seed areas are upriver; they are not exposed or selected and do not exhibit resistance."

Native-Set Oysters Hardy

MSX-active areas usually have predators that prevent tiny seed oysters from surviving. Certain marginal areas, such as Piankatank River, have produced resistant seed, but growth and spatfalls have been inadequate. These seed areas must be monitored with susceptible imported oysters to determine level of MSX activity, and to insure that seed oysters have acquired necessary resistance. Few native-set oysters die or are infected with MSX.

SAN PEDRO AGAIN NO. 1 COMMERCIAL FISHING PORT

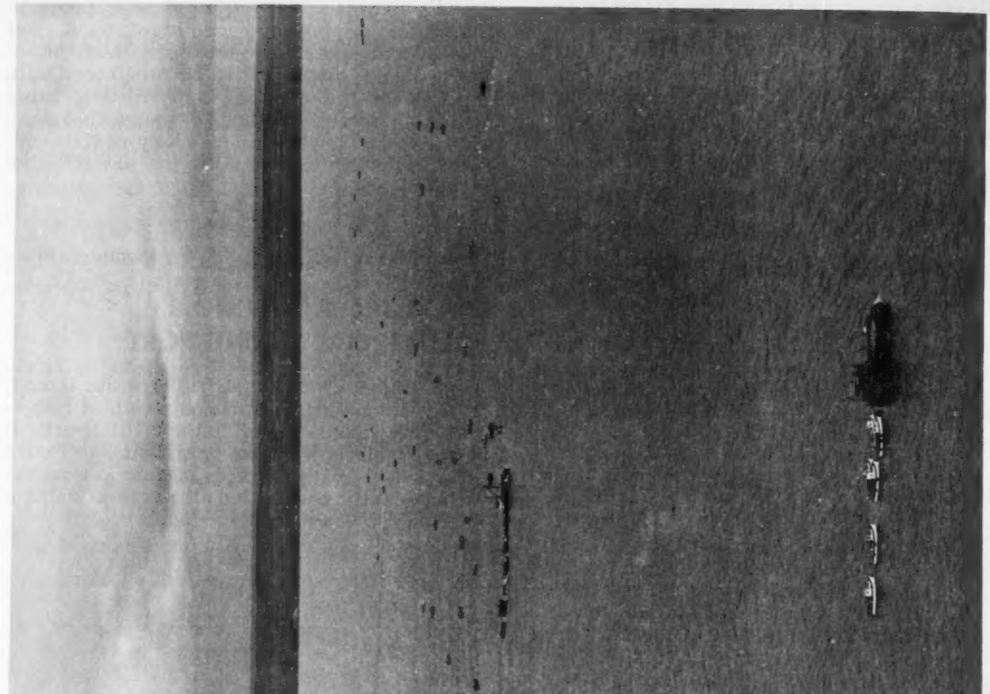
The fleet of San Pedro-Terminal Island, Calif., caught $40.5 million worth of fish in 1969, the largest ever for any U.S. port. It was the 21st consecutive year that San Pedro led all U.S. ports in value of catch. For the 4th successive year, it led all ports in volume of catch--406.9 million pounds.

MEETING

WORLD MARICULTURE SOCIETY MEETS IN TEXAS, JAN. 28-29, 1971

The second annual workship of the World Mariculture Society (WMS) will be held at the Galvez Hotel in Galveston, Texas, Jan. 28 & 29, 1971.

WMS promotes the study of mariculture and marine science and disseminates information in these fields. It is based at Louisiana State University, Baton Rouge, La. 70803. Secretary-Treasurer is James W. Avault.



Hundreds of gillnetters fish Kvichak Bay (adjoining Bristol Bay, southern Alaska). Note 2 lines of boats waiting to sell catches to buying scows. (NMFS-Alaska Photo: J. M. Olson)

FISHING JURISDICTION--
ALASKA'S POSITION

C. A. Weberg
Director of International Fisheries
State of Alaska

Fishermen on both coasts of the United States and Canada, particularly on the West Coast and Alaska, are working hard to obtain extended fisheries jurisdiction.

Why all this interest in recent months and years?

Until 1966, United States jurisdiction extended three miles or to the territorial waters limit. With the rapid increase of foreign fishing vessels, plus new technologies and ability to harvest tremendous quantities of fish on a year-round basis right at our front door, the U.S. Congress passed legislation in 1966 which extended the fishery jurisdiction from three to twelve miles.

This law provides that no foreign fishing vessel can take fish in the area from the coast to a line 12 miles seaward unless an agreement has been reached between the United States and the foreign country allowing special concession to this provision. Our offshore islands also fall under the cover of this statue.

A number of other nations, including Canada, also adopted a similar law providing the coastal states with exclusive fishery jurisdiction out to 12 miles.

Other countries, particularly several in South America, have unilaterally claimed up to 200 miles as within their exclusive jurisdiction and are actively enforcing their claims.

At the time of the passage of Public Law 89-658, which established the U.S. Contiguous Fishery Zone, many persons connected with the fishing industry believed that the new law was inadequate for the protection they sought, and they advocated distances out to the Continental Shelf or 200 miles, whichever was the greatest. However, they recognized the problems associated with obtaining greater jurisdiction and more or less agreed to 12 miles as the best that could be obtained at that time.

Some U.S. fishing interests are opposed to extended jurisdiction for coastal states because they conduct some of their fisheries near the coasts of other nations.

A measure of resource protection was provided in 1958 when the Law of the Sea Conference adopted a convention concerning the Continental Shelf, giving the coastal state authority over shelf organisms which, at the harvestable stage, are either immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil. Several species of crab have been found to qualify as creatures of the Continental Shelf and have been afforded special consideration.

Reprinted from 'Alaska Fish & Game', Sept.-Oct. 1970.

Hundreds of gillnetters fish Kvichak Bay (adjoining Bristol Bay, southern Alaska). Note 2 lines of boats waiting to sell catches to buying scows. (NMFS-Alaska Photo: J. M. Olson)

In the past few years, foreign fishing fleets have taken increasingly larger amounts of the renewable resources off the coast of Alaska.

In 1969, the fleets operating mainly on Alaska's Continental Shelf harvested approximately three billion pounds of fish, including shellfish and a small number of whales. These fisheries are conducted with little or no control by the United States with the exception of several bi-lateral agreements and conventions. The consequence of lack of complete control is that several species of fish may be dangerously near the point of over-exploitation.

While it is true that the United States fishermen do not presently utilize many of the stocks being harvested by these foreign fleets, we expect to in the near future and must insist that a viable resource be available when we are ready.

Additional problems caused by the lack of adequate jurisdiction are connected with the "incidental" catch of species. Foreign vessels trawling for pollock and other species are taking large quantities of immature halibut. This species has been subject to strict conservation regulations imposed under a convention between the United States and Canada. Subsequently, our fishermen are catching fewer mature halibut because of lack of control over this situation.

Emergence of previously undeveloped nations into the marine fisheries arena further complicates the problem. Entry of South Korea into the high seas fishery for Bristol Bay salmon has caused serious concern for this particular stock which has been nurtured and conserved by Alaska and is the object of considerable research by the International North Pacific Fisheries Commission and the federal and state governments.

It appears, therefore, that the best solution to the problem lies in extending the coastal states' fishery jurisdiction to include the Continental Shelf or a set distance of 200 miles, whichever is the greatest distance, and to provide special consideration for migratory species, such as salmon, which go beyond these limits. Perhaps abstention from fishing salmon anywhere but in the coastal zone is a possibility.

Foreign nations could continue to fish stocks of interest to them but only under regulation of the coastal state. By using this means, the coastal state having a vested and special interest in the resource could retain a viable resource for the benefit of its citizens.

MOVEMENTS OF TAGGED BLUE CRABS IN NORTH CAROLINA WATERS

Mayo H. Judy and Donnie L. Dudley

The infrequent exchange of crabs between estuarine systems or between widespread coastal areas shows that a commercial fishery for blue crabs in one area cannot depend on migration of commercial-size crabs from another area.

From 1957 to 1965, 17,237 female and 5,691 male adult blue crabs were tagged and released in North Carolina waters, including two rivers, two sounds, and two ocean areas. Total recoveries were 6,947 tags, or 30.3%. Most recoveries (90-95%) were made within 6 months--and 60-65% of these were recaptured within 3 months after release. Of crabs caught away from tagging sites, 83% of females and 80% of males were caught within 24 km. of release areas. Females moved from estuaries into high-salinity waters in warm weather and returned to estuaries in late fall and winter. Males displayed limited movement between estuary and ocean but generally remained in estuaries.

BLUE CRAB FISHERY

The blue crab, Callinectes sapidus, supports an important commercial fishery along the Atlantic coast from Delaware Bay south to Miami, Fla., and along the Gulf coast from Florida to Texas. Annual landing records of blue crabs over the years show large and sudden fluctuations in abundance that have caused serious economic problems for the industry. As a direct result of these fluctuations, the Atlantic States Marine Fisheries Commission inspired an investigation of the blue crab in the South Atlantic States by the National Marine Fisheries Service Biological Laboratory in Beaufort, N.C. This report resulted from the investigation.

Our article reports male and female crab movements within and between estuaries, between estuaries and the ocean, and movement in the ocean by summarizing recaptures from a large-scale tagging program in North Carolina coastal waters during 1957-65.

Data on seasonal movements of blue crabs are necessary to understand their life history and establish sound management practices. Therefore, the migrations and localized movements of this species have been emphasized in many blue crab studies. Investigations in Chesapeake Bay (Churchill, 1919; Fiedler, 1930; Truitt, 1939; Van Engel, 1958); in Texas (Daugherty, 1952); in Louisiana (Darnell, 1959); in South Carolina (Fiedler, 1962); and in Florida (Tagatz, 1965, 1968) indicated that crab movements were closely related to phases of the life cycle. In Delaware Bay (Cronin, 1954; Porter, 1956) and in Chincoteague Bay (Cargo, 1958) research indicated that crabs scatter widely within their respective habitats but show only limited movement to other inland and coastal waters.

Movements Related to Life Cycles

Generally, movements related to the life cycle are: Early stage immature crabs, after development from eggs hatched in the ocean, move to less saline waters of sounds and rivers, where they mature in approximately 1 year. After their last molt, crabs mate and females begin a gradual movement to high salinity waters for spawning (eggs passed

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from ovaries to abdominal appendage) and hatching their eggs. Since spawning occurs only during warm weather, the actual spawning process may occur from a few weeks to a few months after mating but, once spawning occurs, the eggs will hatch in about 2 weeks. After their eggs have hatched, adult females gradually move from the ocean back into lower salinity waters. In most waters, adult males generally remain in low salinities all year, but in South Carolina and Florida many males, as well as females, migrated to the ocean at spawning time.

MATERIALS, METHODS, & STUDY AREAS

From 1957 to 1965, we tagged and released 22,928 adult crabs obtained from commercial fishermen and from our own gear. Crabs were captured by crab pots, otter trawl, haul seine, and trot lines. A plastic carapace tag (Rounsefell and Everhart, 1953) was attached to each crab by slipping a preformed loop of stainless steel wire (0.4 mm.) over one lateral spine, drawing the wire and tag taut over the back and securely winding the other end of the wire around the opposite spine (fig. 1). The tag bore a serial number on one side, and the laboratory address and reward notice (25 cents) on the other. Display posters at crab dealers and processors and contact with individual crabbers publicized the tagging study. Tag-return data were obtained either by direct contact with the fisherman or by use of tag-return envelopes.

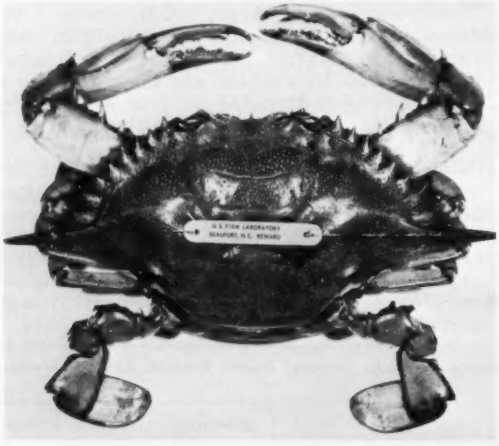

Fig. 1 - Tagged blue crab.

Crabs were tagged in the Newport and White Oak Rivers, Core and Bogue Sounds, and two ocean areas in the general vicinity of Beaufort and Oregon Inlets (fig. 2).

RESULTS

General

From the 17,237 female and 5,691 male crabs tagged, we recovered 6,947 tags (30.3% of total). Insufficient information accompanied 260 tags (3.7% of tags returned). Thus, 5,260 female returns (30.5% of females released) and 1,427 male returns (25.1% of males released) were used in the final analysis.

Release and recovery data for blue crabs (all female tag groups, and one male tag group) released in the Newport and White Oak Rivers, Core and Bogue Sounds, and Ocean Area #2 are shown in tables 1 and 2. (Due to very limited male-crab movement, data for males are shown in table form only for Newport River area.) Due to limited tagging and to small percent of tags returned, no table was prepared for crabs released in the Oregon Inlet area.

Although tag recovery is influenced by fishing intensity, it was beyond the scope of this study to deal with catch statistics. No tagging area had a uniform blue-crab fishery throughout the year. That our tag returns were dependent on fishing pressure was reflected by especially high and low recovery rates for some areas and times. Recovery rates were especially high in inside waters during winter and spring, and in the ocean during spring and summer when fishing effort was usually high in these areas (tables 1 and 2). Although fishing effort altered seasonal distribution of recoveries, we do not believe it materially affected conclusions regarding crab movement.

The percentage of tags returned varied widely with the area of release. The rate of tag returns was highest (51.4%) from White Oak River, and lowest (15.4%) from Oregon Inlet area.

Returns from tagging sites accounted for 77.2% of all recoveries (5,166 crabs). Tagging site, in this study, is defined as the river

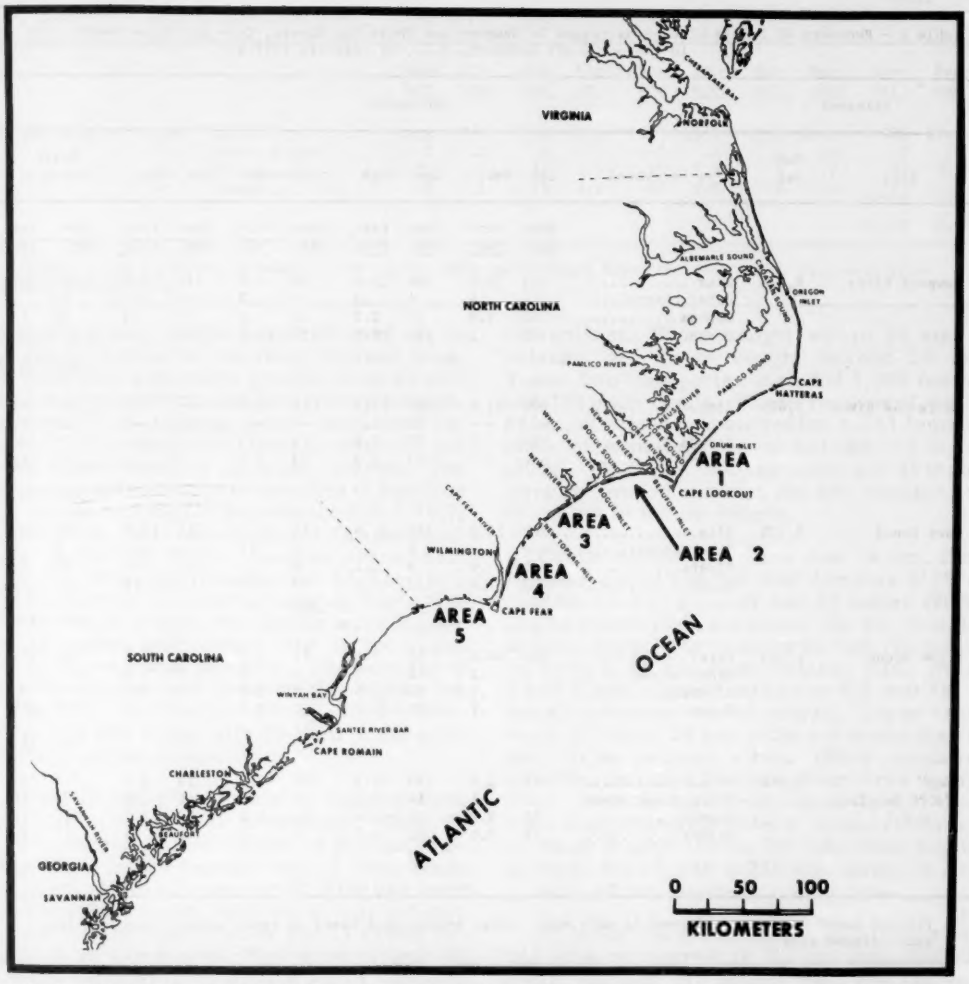

Fig. 2 - Atlantic coast, Chesapeake Bay to Savannah, showing areas where tagged blue crabs were released and captured.

Table 1 - Recovery of female blue crabs tagged in Newport and White Oak Rivers, Core and Bogue Sounds, and in the ocean off Beaufort, N.C., by quarters 1957-65

Released			Recovered									
Area	Number	Area recovered	Jan.-Feb.		Apr.-June		July-Sept.		Oct.-Dec.		Total recovered	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Newport River	6,814	Site	471	30.0	304	19.4	98	6.2	127	8.1	1,900	63.6
		Other rivers	6	.4	4	.3	3	.2	---	---	13	.8
		Sounds	45	2.9	35	2.2	11	.7	4	.3	95	6.0
		Ocean	2	.1	293	18.6	157	10.0	11	.7	463	29.5
											1,571	23.0[1/]
White Oak River	2,699	Site	605	41.9	686	47.5	14	1.0	---	---	1,305	90.3
		Other rivers	---	---	20	1.4	---	---	---	---	20	1.4
		Sounds	12	.8	37	2.6	4	.3	---	---	53	3.7
		Ocean	---	---	43	3.0	23	1.6	1	.1	67	4.6
											1,445	53.5[1/]
Core Sound	3,335	Site	202	24.0	268	31.8	56	6.6	115	13.6	641	76.0
		Other sounds	---	---	6	.7	2	.2	---	---	8	.9
		Rivers	5	.6	9	1.1	6	.7	---	---	20	2.4
		Ocean	3	.4	119	14.1	50	5.9	2	.2	174	20.6
											843	25.3[1/]
Bogue Sound	1,583	Site	289	44.5	59	9.1	10	1.5	58	8.9	416	64.1
		Other sounds	1	.1	1	.1	3	.5	1	.1	6	.9
		Rivers	2	.3	10	1.5	9	1.4	---	---	21	3.2
		Ocean	1	.1	138	21.3	63	9.7	4	.6	206	31.7
											649	41.0[1/]
Ocean (Off Beaufort, N.C.)	2,448	Site	7	1.0	183	26.3	302	43.3	23	3.3	515	73.9
		Other ocean areas	1	.1	14	2.0	4	.6	1	.1	20	2.9
		Sounds	57	8.2	31	4.4	10	1.4	21	3.0	119	17.1
		Rivers	14	2.0	22	3.2	5	.7	2	.3	43	6.2
											697	28.5[1/]

[1/] Percent based on number released in each area, other percentages based on total number recovered from each release area.

Table 2 - Recovery of male blue crabs tagged in Newport River, by quarters 1957-61

Released			Recovered									
Area	Num- b	Area recovered	Jan.-Feb.		Apr.-June		July-Sept.		Oct.-Dec.		Total recovered	
			Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Newport River	4,290	Site.....	358	35.5	218	21.6	158	15.7	152	15.1	886	87.9
		Other rivers.....	2	.2	1	.1	2	.2	2	.2	7	.7
		Sounds.....	30	3.0	16	1.6	19	1.9	9	.9	74	7.3
		Ocean.....	1	.1	12	1.2	20	2.0	8	.8	41	4.1
											1,008	23.5[1/]

[1/] Percent based on number released in each area, other percentages based on total number recovered from each release area.

or sound where crabs were released or, in the ocean, within 24 km. from release area. We considered distance greater than 24 km. as showing more than just random movement. Recoveries at tagging sites accounted for 73.7% (3,877 crabs) of all female returns, and 90.3% (1,289 crabs) of all male returns. The difference between site recoveries of females and males was highly significant (X^2 = 39.7, P.01 = 6.63). No crabs tagged at Oregon Inlet were recovered there. In other areas, 63.6 to 90.3% of tagged females and 87.9 to 100% of males were recovered at tagging site. Site recoveries in rivers and sounds were higher during winter and spring, and in the ocean during spring and summer. The percent of on-site returns was consistently higher for males. The percent-return-by-area for females was altered greatly by their movement to and from the ocean.

Returns other than those at tagging sites indicated limited crab movement. Only 20 tags were recovered outside of North Carolina: 17 from Chesapeake Bay, 3 from South Carolina. All crabs recovered in the bay were released in Oregon Inlet area only a short distance from bay. Two of the 17 crabs recovered in Chesapeake Bay were males; all other recoveries from outside North Carolina were females.

MOVEMENT

Location and Distance

Crabs recovered away from their respective tagging sites were separated into two categories: Those caught within 24 km. of release, and those caught beyond 24 km. These two categories included 1,383 female and 138 male crabs. Those recovered within 24 km. of release accounted for 1,143 females (83% of nonsite recoveries) and 110 males (80%). Of these, 800 females and 42 males were recovered in ocean, and 343 females and 68 males in inside waters.

Crabs recovered more than 24 km. from release accounted for 240 females (17% of nonsite recoveries) and 28 males (20%). Ocean recoveries accounted for 135 females and one male. The male crab was recovered in Area 3, 56 km. from release site. Areas 2 and 3 had highest numbers (54 and 39) of females recovered in ocean. These crabs were at least 24 km.--but not more than 80 km.--from release sites. Other ocean recoveries included 26 crabs from Area 4, nine from Area 5, four from Area 1, and three from South Carolina waters. Crabs recovered in Area 4 were 40 to 160 km. from tagging sites; in Area 5, 120 to 210 km. away; in Area 1, 40 to 80 km. from release sites.

Of those caught in South Carolina waters, one was recovered in Winyah Bay, 298 km. away; another off Santee Bar, 314 km. distant; and another off Beaufort, S.C., 442 km. from tagging site. These three represented longest migrations during this study.

The few remaining crabs (105 females, 27 males) that moved more than 24 km. from release sites were recovered in inside waters. Crabs that moved from ocean to inside

waters included 59 females and 3 males. Fifteen of those females, and 2 of males, were released in Oregon Inlet area and recovered in Chesapeake Bay. These crabs were 65 to 205 km. from release site but not more than 48 to 65 km. inside bay. Other crabs had moved among various inland habitats. Over all, the distance from release to recovery for females recaptured in inside waters ranged from 40 to 258 km.; males 40 to 80 km.

Direction

Tagged crabs caught more than 24 km. from release areas were grouped by direction of movement. Of the 240 females, 84% (201 crabs) had moved south or southwest, and 16% (39 crabs) north or northeast. Movement of male crabs was opposite that of females. Of the 28 males, only 14% (4 crabs) had moved south or southwest, and 86% (24 crabs) north or northeast.

Speed

Crabs are capable of rapid movement. Knowing the time of release and recapture for recovered crabs--and the approximate distance of travel--allows an estimate of movement speed. Using only the earliest recoveries allows estimates of maximum speed.

Of crabs that traveled 16 to 24 km., the daily travel for the 100 earliest returns averaged 2.9 km. and ranged from 1.7 to 12.1 km. Four crabs averaged 8 km. per day. For travel greater than 24 km., we determined speed from the first recoveries at various distances from the release site. The most rapid movement was 11.6 km./day by a crab that traveled 314 km. (table 3).

Table 3 - Time-distance relationship for 8 blue crabs, Callinectes sapidus

Time out	Distance moved	Kilometers per day
Days	Kilometers	
4	32	8.0
5	40	8.0
33	80	2.4
31	105	3.4
34	121	3.5
39	137	3.5
42	153	3.6
27	314	11.6

LONGEVITY

Only 1.5% of the females (79 crabs) and 1.1% of the males (16 crabs) were recovered after 1 year at liberty. Eight of the females and three males were recaptured after 2, but less than 3, years. Greatest liberty periods were 940 and 1,058 days for recaptured females, and 540 and 769 days for males. These were all caught within 24 km. of their release sites.

CONCLUSIONS

In North Carolina, after the waters have warmed and during warm weather, female crabs move to high salinity for the purpose of spawning and hatching their eggs (Dudley and Judy, unpublished data). In late fall and winter, females move back into the estuaries. Only a few male crabs move from the rivers and sounds into the ocean. There was some movement by both male and female crabs between rivers and sounds; but males were less active than females and tended to remain in the area where they were tagged. Coastwise movement, mostly by females, was usually less than 80 km. and was generally south.

Commercial-size blue crabs in North Carolina do not engage in migrations that would make them available to a succession of fisheries along the coast. Thus, in North Carolina, the commercial fishery for blue crabs in any estuarine system is dependent on the number of crabs which reach maturity within that system. The population of blue crabs in one estuary, however, may be influenced by what happens in another estuary. Blue-crab larvae hatch and develop in the ocean and can be transported long distances from their point of origin (Nichols and Keney, 1963). So, even though the adults do not move up and down the coast, there is probably an interchange between estuaries as the result of larval transport.

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ROY I. JACKSON

FAO'S JACKSON VIEWS FOOD NEED AGAINST PLANET'S 'LIFE-CARRYING CAPACITY'

Roy I. Jackson, Assistant Director-General (Fisheries), Food and Agriculture Organization (FAO) of the United Nations, looked at the future of world fisheries in the decades ahead against the background of "increasing world population and deteriorating aquatic environment" and saw both problems and hope--"if we behave rationally."

Mr. Jackson was keynote speaker at centennial celebration of American Fisheries Society in New York City on Sept. 14, 1970.

World population is doubling every 37 years, he said. If current rates of increase continue to apply, 3.7 billion population today will reach 29 billions in 100 years.

Industrial development--with its alteration of environment, pollution, and consumption of resources--increases exponentially in relation to population growth. Most of this development is profitable by conventional economic standards, but it often overlooks social costs and leads to uses that would deny the earth to future generations.

Jackson said: "Aquatic environments, communities, and species, once lost, are nonrenewable resources. To keep fish stocks and other living aquatic resources as renewable resources may require that fishery biologists become true guardians of the waters."

Estimates of Future Fishery Production

Estimates of future production from world fisheries range from values already exceeded to values 30 times the present catch. Estimates for FAO's Indicative World Plan indicate possible annual catches of 140 million metric tons before the year 2000. About 100 million tons of these would come from marine species such as those fished today. The balance would come from freshwater fisheries, fish and shellfish culture, and species unused or underused today. Developments of aquaculture and fisheries on new species could increase the estimates several times. "The need for research and management will become increasingly acute as fisheries continue to develop," Jackson emphasized.

Difficult Period Ahead

"The total picture of world problems is obscure and somewhat grim. But there are reasons to take heart," said Jackson. The population problem is at least recognized. In highly developed countries, environment has the limelight. "Famine is not necessarily imminent. The world food supply, which includes fish protein, can be adequate in the decades immediately ahead." But to have supply produced where it is needed most will require changes in traditional social and economic practices.

Jackson concluded: "We have a formidable and exciting task in implementing our concern for the future. We must remain aware that even a century is too little foresight. The truly long-term life-carrying capacity of the planet must be our most vital concern."

ROY JACKSON'S SPEECH

Mr. Jackson's speech was titled: "Famine and the World Fisheries." Nearly all of it follows.

In the century just past we humans have changed our numbers, our way of living, and our environment faster than in any comparable period of history. The rate of change continues to accelerate. Our fisheries problems are sometimes regarded as minor among growing world concerns. But they are ecological concerns, and are part of what Garrett Hardin calls "the tragedy of the commons". The commons is the earth, and the essence of the tragedy resides in the remorseless consequences of not obeying Nature: the ever-expanding world population, accumulation of its wastes, and disruptions from expanding technology.

Nature and man's fate are inseparable, and future fishing cannot be evaluated apart from the world of men or from the environment. We must estimate how many people may exist in the future. It is imperative that we recognize that both the quality of human existence and the quality of the environment in which fish live will be determined largely by what we humans do to the total environment. We must determine how much food, particularly animal protein, the future population will require, and consider possible new foods. We can make informed guesses about the sizes and kinds of future catches and which sea and freshwater area will produce them. None of us believes any longer, if any of us ever did, that aquatic resources are limitless. ...

The Future Population

Today we are 3.7 billions. Many of us have lived through one doubling of the world's population and many of us will live through a second--in 37 years. (Based on the UN medium assumption for population growth rates.)

There are enormous differences in population distribution by countries and by regions. Today 28% live in the so-called "developed regions", which include Europe, the Soviet Union, North America, Oceania, and Japan; and 72% live in the so-called "developing regions", which include the Far East (excluding Japan), the Near East, Africa, and Latin America.

Undoubtedly these differences will be aggravated. Some countries will be less interested or less successful in limiting their populations. If present regional trends continue for the next 100 years, 10 per cent will inhabit the developed countries and 90 per cent the developing regions.

The demographers' predictions that I have seen stop at the year 2030, because unknown changes in the rate of increase are expected. If intrinsically desirable progress in health and social justice continues, the population could, for a time, become even larger than

present trends indicate. But rates of population growth will eventually decrease. Wars, disease and famine will reduce survival in proportion to our failure to limit births. This aspect of the tragedy of the commons has no purely technical solution.

The Future Environment

Our multiplying population and advancing technology combine to make us the most influential part of the earth's ecosystem. We are responsible for the most precipitous changes, both damaging and beneficial. Peoples of advancing cultures have always prided themselves in being "conquerors of nature". We have been paramount among them, and we are increasingly prodigious consumers as well.

I use the word "consumers" advisedly, because it is as consumers of natural resources, renewable and nonrenewable, that we must see ourselves. On the average, with massive inequalities, we enjoy higher standards of nutrition, health, and shelter than society has ever known. To acquire these essentials--and many nonessential amenities--for our greatly increased numbers we are increasing greatly our per-capita consumption of the resources of the earth that are essential for our life processes.

We know that every stock, every living population, if its numbers are to be sustained, must come into balance with its environment and its food supplies. As we now live, our renewable living resources depend on nonrenewable natural resources: oil, coal, other minerals, environments, and ecosystems. Since they include self-reproducing organisms, ecosystems are not customarily listed among nonrenewable resources. But once destroyed, their former structure cannot be reconstituted. The supply of all these nonrenewable resources, including conventional energy sources, is limited. All the food that is produced or caught or distributed by modern methods costs a great deal in energy, whether this be used to make steel, or to fuel chemical fertilizer plants, tractors or fishing boats. Therefore, we must be aware of the eventual consequences that can come from exercizing our clear capability of looting the commons.

We create wastes in proportion to our use of resources. Wastes that are not neutralized, stored, or put to beneficial use become pollutants. The quantities and varieties of pollutants increase exponentially in relation to our population growth. In the United States the rate of increase of industrial wastes is three times as high as the rate of population increase. And in the U.S. today there is three times as much industrial pollution as domestic pollution.

The waters where our inland fisheries and the artificial culture of fishes take place are highly sensitive to pollutants. Our coastal fisheries are in zones that are first to be affected by the outpourings from the land. The Federal Water Quality Administration lists five major kinds of pollution in coastal areas: bacterial contamination; decomposable organic materials that deplete dissolved oxygen; pesticides, herbicides, and toxic wastes from chemical manufacturing; materials that act as fertilizers for some life forms at the expense of others; and inert materials that fill invaluable estuarine areas and smother benthic life forms.

To this list we can add thermal pollution, oil spillages, and, for heightened drama, dumpings of leftover mustard gas in the Baltic and nerve gas in the Atlantic. Even what we cast into the air finds its way into the sea.

We know that the blight is broad and spreading. The historic Rhine has been an historic sewer for a long time. The deeper layers of the Baltic have much less oxygen and much more phosphorus than at the beginning of the century. The Soviet Union, in spite of its vast area and centralized authority, finds that its rivers, lakes and coastal waters are rapidly deteriorating. More examples, of varying scope, can be found in every continent and on most inhabited islands of the world.

In his keynote address to the 93rd Annual Meeting of the American Fisheries Society, Justin W. Leonard spoke of the "ecological illiterate", those who plan and operate our technological society but think that food comes from the supermarket and water from the tap. Seven years ago he said, "ecology and natural history have become old-hat. They aren't quite respectable anymore". Times have changed again. Everywhere we hear loud alarms, read passionate convictions, and see action to protect or restore the quality of our environment.

But there is still a danger that the subject can become old-hat again if we let up on either investigating or publicizing the continuing issue. We must continue to examine and report the more obvious effects of pollution. But as specialists we should continue to uncover and relate the less obvious effects of conflicting uses of water as well.

The effects of altered water flow regimes on snails can be taken as examples. In the Potomac River the oyster drill, a snail, is killed each year during spring freshets. This permits an extension of oyster culture up the estuary. Proposed dams on the Potomac will regulate spring flows, the drills will not die, and fewer oysters will live to be eaten by man. In the Nile River region perennial irrigation replaces seasonal flooding. This also favours increases in a snail, the intermediate host of a parasitic worm. The worm causes extremely debilitating schistosomiasis disease in man. In Upper Egypt the new Aswan High Dam development may increase the intensity of infestation. At the same time it may seriously reduce the Eastern Mediterranean sardine fishery while providing an impoundment for freshwater fish.

In the case of the Nile, man faces the immediate problem of evaluating whether the increased electrical power and starch and freshwater protein are worth the increased disease and decreased marine protein. A less immediate but perhaps more important problem is whether the impoundment behind the dam, which has a lifetime probably measurable in decades, has a long-term value equivalent to the marine environment that will be affected.

An economist might calculate, by using widely accepted economic value criteria, that the most profitable use of the Nile can be obtained by damming it, and that the most profitable use of the Rhine is as a sewer. Also some apparently calculate that the most profitable way to obtain oil from Saudi Arabia is to first flame off the natural gas and add a

bit more carbon dioxide to the already overburdened atmosphere. I disagree with most conventional profit valuations. They include private costs but overlook social costs, and lead to uses that would deny the earth to our generations of progeny.

Besides the continued expansion of present multiple uses of water, we can expect more kinds of uses, especially in the ocean. The ocean floor is criss-crossed with cables, and pipelines are following suit. Oil derricks now line the horizon in many nearshore areas, and underwater oil storage tanks may become common. Mining from the sea floor will certainly increase. Except that boats must dodge and gear may foul, these physical structures and activities do not conflict greatly with fishing. Accidental release of oil from wells, huge tanks, or pipelines, however, could cause much pollution. Other uses of the sea might, for example, require diversion of currents to change weather patterns. This kind of activity should be approached very cautiously. It could, in some ways, be very useful to terrestrial man while very harmful to aquatic systems.

The Future Fisheries

The fisheries can do much to help meet the continuously increasing demands for food. Estimates indicate that the world catch of fish today could supply about 70% of the animal protein requirement of the present population. This figure is subject to many qualifications, and it should not be interpreted to mean that fish does supply that much of human needs. More than half of it is consumed by livestock, and the world distribution is very uneven. But it shows how important fish protein could be in the world diet.

The record of the past quarter-century is encouraging for the decades immediately ahead. Since 1946, catches have increased about 6% per year--considerably faster than the world population--to reach a total of 64 million metric tons in 1968. . .Of this total, about 7 million tons came from fresh water. Forty-one per cent of the marine fish catch is taken in the Atlantic, 55% in the Pacific, and only 4% in the Indian Ocean. Divided another way, 54% is taken in north temperate waters, 29% in south temperate waters, and 17% in tropical waters. The north-south division shows the great expansion of fishing beyond the northern waters, where 73% of the total was taken 10 years before (1958). . . .

A detailed estimate of the potential was completed by FAO this year as part of the Indicative World Plan for Agricultural Development. The FAO study produced several figures for the world aquatic potential, because much depends on what is included in the potential. The largest possible harvest source is the plants of the sea--plus freshwater fisheries. . . .Ocean plant production is fairly generally agreed to be in the range of 150-200 billion tons per year. Man's annual harvest could approach this production if it were technically feasible to catch and process the very small plants and animals at an economic cost. Although the technological and economic possibilities for the year 2070 are not predictable, no method for economically harvesting or using a significant proportion of this material is even conceivable at present.

The FAO study succeeded in making estimates for nearly all those animals that now support major fisheries: whales, large pelagic fishes (tunas, bill-fishes), medium to large demersal fishes (cods, flounders, seabreams, etc.), and shoaling pelagic fishes. Under ideal conditions of exploitation, these together could provide catches of about 100 million tons. But the limit of the "traditional" ocean fish (excluding squid and other molluscs) is likely to be reached in the 1970s. Even this may be optimistic, because it would require that we obtain the maximum catch from all stocks. Preliminary figures suggest that the 1969 world fish catch was somewhat less than that of 1968--the first decline since FAO started collecting comprehensive world statistics nearly a quarter of a century ago.

The familiar types of crustaceans (shrimp, rock lobsters) could provide somewhat over 2 million tons per year. Large quantities (1.2 million tons in 1968) of squid, cuttle fish, and octopus are being caught. No estimates could be made of their potential, but since various species of squid are found commonly in all parts of the ocean, their potential must be large.

No projected estimate was made for the other molluscs (clams, oysters, mussels) of which the 1968 world harvest was 2.2 million tons, because the possibilities for increased harvest come more from cultivation than from natural production.

Finally, estimates of potential catches from the sea must include the smaller but exceedingly abundant animals, such as the krill (euphausids) of the Antarctic and the lantern fish (myctophids). At present it is not possible, to my knowledge, to harvest these economically, though the Soviet Union seems close to using krill on a commercial scale. The potential of these small animals is vast--probably several times the present world catch of all fishes.

The yield of freshwater fisheries for 1968 was 7.4 million tons, about 11.5% of the total world production. This excludes the very large subsistence and sport fisheries, estimated to be at least half as large as the recorded commercial catch. Inland fisheries could provide much more food than they do now. Their future depends largely on the prevention of further deterioration in water quality, and on the improvement of those waters that are already despoiled. On the brave assumption that this will be done, let us consider the future production of fish from fresh water.

The catch from large inland lakes and rivers probably could be doubled, but the major increase from lakes and reservoirs will come from smaller bodies of water where management techniques can be applied. In these waters up to five times the present catches seems possible. But controlled culture is our greatest opportunity for increasing fish production. The larger lakes produce about 5 kg/ha. (a hectare, ha., is 2.471 acres); the smaller lakes produce up to 150 kg/ha. Managed ponds in tropical and subtropical areas commonly produce 1,500 to 2,000 kg/ha., and under very intensive management 6,000 to 7,000 kg/ha.

Generally fish are fed supplemental materials that are not now consumed by humans,

and some convert vegetable proteins into animal protein, including all ten essential amino-acids, very efficiently. For example, some work in the United States has shown that channel catfish have a feed conversion of 1.3 (that is, it takes only 1.3 pounds of feed to produce 1 pound of flesh). By contrast, beef cattle have a feed conversion of about 16.

The Lines of Action

Our action must be fundamental. To deal with effects without also dealing with causes is inadequate and superficial. What M. King Hubbert has written applies to fishermen as to all men. As he sees human history, the period of rapid population and industrial growth that has prevailed during the last few centuries is an abnormal, brief, transitional episode. He foresees a period of non-growth that will pose no insuperable physical or biological problems but that will entail a fundamental revision of our current economic and social thinking.

Future non-growth of the human population is a certainty. When this will occur, at what maximum number, and through what mechanisms--barring natural catastrophe--depends entirely on us humans. This is not just a problem for Asians, Africans, or Latin Americans. It must be faced by every one of us in our own neighbourhood.

In many of our activities, we, the technologically developed cultures in particular, follow the archaic approach to the problem of the commons, that of free and unlimited access. If this approach is justifiable at all, it is justifiable only under conditions of low population density. As the human population has increased the commons has had to be abandoned in one aspect after another. Traditionally we have treated the air we breathe and the waters of the earth, along with their inhabitants, as commons. This is changing, and it must change more radically, and soon.

Properly oriented changes can only occur where there are perceptive and knowledgeable persons to show the way, to monitor, and to be watchdogs. Most natural history movements have addressed themselves to terrestrial communities; there has been a dearth of guardians of the waters. Meanwhile we fishery biologists have to a large extent allied ourselves with conventional exploitive processes. Even personally we have not been sufficiently appalled by the demise of environments and the extinction of aquatic species and communities.

Within the framework of the problems we must face as citzens of the world and as general watchers of the waters there are particular fisheries problems that we must face as fisheries scientists and administrators. The pressing problems of the world fisheries, at least for the early part of the coming century, are three:

(1) to manage the limited resources of "traditional" fisheries in the most effective way;

(2) to develop fisheries on the large resources of less familiar animals;

(3) to increase cultivation, especially of species (for example some molluscs and freshwater fish) that feed directly on plants.

We must be particularly concerned with proper management. The past record of management shows the effects of our reluctance

to abandon the commons with respect to fisheries. On the high seas, the Antarctic whales were rescued on the limit of commercial extinction--possibly absolute extinction of blue whales. Where only one country is concerned the record often is not much better--the California sardine is an example. But there have been successes; effective conservation of the whales in the Antarctic is beginning, and fishing is controlled in several major fisheries.

Future Management of Fisheries

Three forms of jurisdiction have been proposed for future management: wide extensions of fishing limits, to place most fish stocks under national jurisdiction; direct international, United Nations, control of high seas resources; and expansion of the present pattern of regional international fishery bodies and commissions. . .

Management must start with control of the individual fisherman. We generally assume that anyone should be free to fish on the high seas, or any national within his own territorial waters, so long as he does not use obviously damaging methods like poisons, explosives, or devices that catch immature fish. Fishing is constrained by restricting the effectiveness of each fisherman--by explicitly prohibiting the most effective gear, or by closing areas or seasons.

The traditional assumption, that fishing is free to all, is unrealistic and has led to inefficient resource management. Each fish stock is limited. If it is accepted that fishing is a privilege, not a right, then one likely method of controlling excess fishing is to charge for this privilege. This control could be accomplished if the payment, license fee, were in proportion to the privilege conferred. In several major fisheries, for example Pacific salmon, the gross value of the catch greatly exceeds the basic cost of harvest--sometimes several fold. There the right to fish with the most efficient gear might be worth up to 80% of the gross value of the catch.

Who gets this license fee is a matter of jurisdiction. Inshore it could clearly go to the coastal state, offshore it might, under one scheme, go to the proposed international agency.

If we optimistically assume that improved management practices are instituted, it is possible to visualize the ocean fisheries of the early twenty-first century. On the fishing grounds that are familiar today--the Grand Banks of Newfoundland, the anchovy fishery off Peru--the fishing vessels will be fewer. They will be helped by a flow of information on the distribution of fish, and on weather and water conditions from satellites and buoys. These vessels will make large catches and pay substantial license fees. Some of these fees will be used to provide the satellites and other information systems, and the scientific research on which the management is based.

The other major sea fisheries, dominant in weight but probably not monetary value, will be in the Antarctic on krill, and along the major upwelling systems on the small lantern fish and other animals. By harvesting the traditional stocks efficiently, it would become possible for men and vessels to be diverted to these less familiar stocks as well as to stocks like squid and whiting that are not being used to the extent they might be.

Technology's Role

The development of the technology to harvest and use the less familiar fish will demand initially the resources of the richer developed countries, and will at first be of less concern to the developing countries, for whom FAO has a special responsibility. But there are already shifts in emphasis and interest in fisheries from the highly developed countries to the intermediate nations. Because labour costs are less and other economic opportunities are fewer, the new fisheries are likely to be developed and used by developing countries in the long run. This is probably economically desirable for the world as a whole.

Fish flesh contributes about 11% of the animal protein now consumed by man. This percentage should increase considerably in the future. In order to do this we must develop more efficient catching methods and provide adequate transport and processing, especially in the developing countries. For example, the control of insect infestation of fish products in Africa could double the amount of fish reaching consumers. Above all we must alter our eating habits. Thousands of tons of good protein are unused because even people who do not already have adequate protein in their diets refuse to eat all but a few traditional species.

Controlled culture of marine and freshwater species is a great opportunity for increasing production. By using techniques such as the raft method developed for mussels in Spain, the possibilities for shell fish seem very large. Running freshwater cultures are highly efficient in converting fish food to human food. We must develop and apply these techniques to commercial production. Controlled culture is limited by economic considerations rather than natural productivity, at least until we run short of nonrenewable resources.

Some Hopeful Signs

I have said earlier that the total picture of world problems is obscure and may be short on hope. But there are some developments from which we can take heart. The population problem is at least recognized as the central theme of the tragedy of the commons. And in highly developed countries the environment has the limelight. There is action as well as talk.

National and international actions are having some positive effects on fisheries management, and initiatives that affect fisheries resources have multiplied in recent years and even months. The President of the United States has proposed fundamental changes in the agencies that deal with environmental problems, including fisheries research and administration. Pacem in Maribus, the convocation on the oceans, held at Malta in June 1970 highlighted the growing competence of the world to exploit the oceans' resources. The need to strengthen present measures and introduce new ones to preserve renewable resources and make beneficial and equitable use of the others was clearly expressed. We in FAO are striving to strengthen the growing network of regional international fishery bodies. A third Conference on the Law of the Sea is expected to be held soon. Many other important initiatives could be added to this short list. A great value of the exploited ocean

may be that it will encourage nations to regard one another as partners in world progress.

About "Famine and the World Fisheries" we can conclude that famine is not necessarily imminent. The Second World Food Congress, held in June 1970, in The Hague under FAO auspices, concluded that world food supplies can be adequate in the decades immediately ahead. Animal protein, which includes fish, is an essential part of this food supply. It is both humane and very pragmatic that we increase production and that it ends up--preferably is produced--where it is needed most. This will require some changes in traditional economic practices, and it will certainly require that we eschew the disruptions of warfare, which bring famine and disease faster than any other human activity.

New Protein Sources

Whatever its portents for the far future, carefully applied technology is needed to grow or catch the foods that the growing population will require. In addition it could provide some new sources. Scientists apparently have isolated bacteria that require only methane to multiply. The bacteria are 50% protein. In Britain a plant is being built to produce 60,000 tons of protein per year, and a hydrocarbon-based yeast factory to produce 4,000 tons per year is due to be finished in 1970. An American scientist states that in less than 10 years it will be possible to produce protein artificially from petroleum in unlimited quantities. These developments could become important in providing protein, so long as the limited supply of fossil fuel lasts.

This is my view of the near future. But to conserve nonrenewable resources and preserve the environment for ourselves and the renewable resources in the increasingly crowded and technically complicated world of the next 100 years will be a formidable as well as exciting job. Fisheries workers must shoulder much of the aquatic part of that job. If we do not, who will? And we must remain aware that even a century is too little foresight. The truly long-term life-carrying capacity of the planet must be our most vital concern. There is still time to implement this concern, and fortunately Nature eventually corrects many of our mistakes--if we behave rationally.

FERRO-CEMENT FISHING BOATS DELIVERED TO FAO

Two ferro-cement fishing boats have been delivered to FAO for work in the United Arab Republic (Egypt).

The boats will be used in Lake Nasser to demonstrate new fishing techniques, and as prototypes for similar craft. The 5-year, $2,684,000 project is being financed under the UN Development Program with matching contributions by Egypt.

A Nervi Production

The vessels, designed specially for use in Egypt, were built in Rome to FAO specifications by Nervi and Bartoli. Pier Luigi Nervi is a pioneer in reinforced concrete. His firm built sports stadia and arenas in Rome for the 1960 Olympics, and a bus terminal in New York.

Ferro-Cement

Except for wooden flooring inside the hulls, the boats are entirely of ferro-cement, a process developed by Prof. Nervi over 25 years ago. Steel rods and wire mesh are shaped into the form of a hull and plastered over with fresh cement. When dry, the whole is as sturdy and seaworthy as wood or steel.

Ferro-cement differs from reinforced concrete in making greater proportional use of steel over cement. It produces suprisingly thin and light hulls. The hull of the smaller FAO boat is only 2.2 centimeters ($\frac{7}{8}$ inch) thick, the larger 2.5 centimeters (1 inch).

The boats underwent preliminary tests by FAO technicians at Fiumicino, near Rome, and were pronounced ready. They will be shipped by freighter from Naples to Alexandria, UAR, cradled one within the other, then transshipped to Aswan on Lake Nasser, created by damming the Nile.

The Craft

The two craft are completely open and undecked. The larger is 10 meters by 3.06 meters (32 feet, 8 inches by 10 feet), weighs 5.1 tons and has 5-ton carrying capacity. It is powered by a 15-HP Petter inboard air-cooled Diesel engine for a rated speed of 6.5 knots.

The smaller craft measures 7.50 by 2.38 meters (24 feet, 7 inches by 7 feet, 10 inches), weighs 2.8 tons, and has a 2-ton carrying capacity. It is powered by a 7.5 HP Petter inboard air-cooled Diesel for a rated speed of 6 knots.

The two boats were designed by Øvind Gulbrandsen and Arne Fredrik Haug of Norway, naval architects in FAO's Fishing Vessel Section.

Nervi Cites Advantages

Prof. Nervi foresees a growing future for cement that floats. The 80-year-old architect and engineer said the process was especially suited to fishing because of its extreme strength and imperviousness to water.

He noted: "There is no danger of warping, rotting, rusting or water-logging. A hundred years from now these boats will be as dry as they are today. As for sturdiness, the hulls are a complete, monolithic whole. If you strike them they resound like a bell would. Stresses and strains are spread evenly throughout. And they are resistant to fire and marine growths."

Prof. Nervi added that a yawl he built in 1948 was afloat and well at Anzio, south of Rome.

Watzinger Agrees

Herman Watzinger of Norway, Director of the Fishery Industries Division, said ferro-cement is competitive with other materials, especially in wood-scarce countries like Egypt. He emphasized:

"Ferro-cement boats are quite simple to build and maintain, and repairs are easy to make. They are not prey to marine borers, which makes them ideal for use in tropical climates. Hulls can be perfectly finished so that they are virtually indistinguishable from other materials."

Teaching at Lake Nasser

At Lake Nasser, an FAO boat-builder, Michael A. Shawyer of the United Kingdom, will teach local builders how to construct boats in ferro-cement. He was trained in ferro-cement by Nervi earlier this year. Another Nervi-trained FAO boat-builder, Richard G. Lefebre of Canada, now is teaching ferro-cement construction in Dahomey under FAO Freedom from Hunger Campaign.

Fig. 1 - The two ferro-cement boats at Fiumicino, Rome.

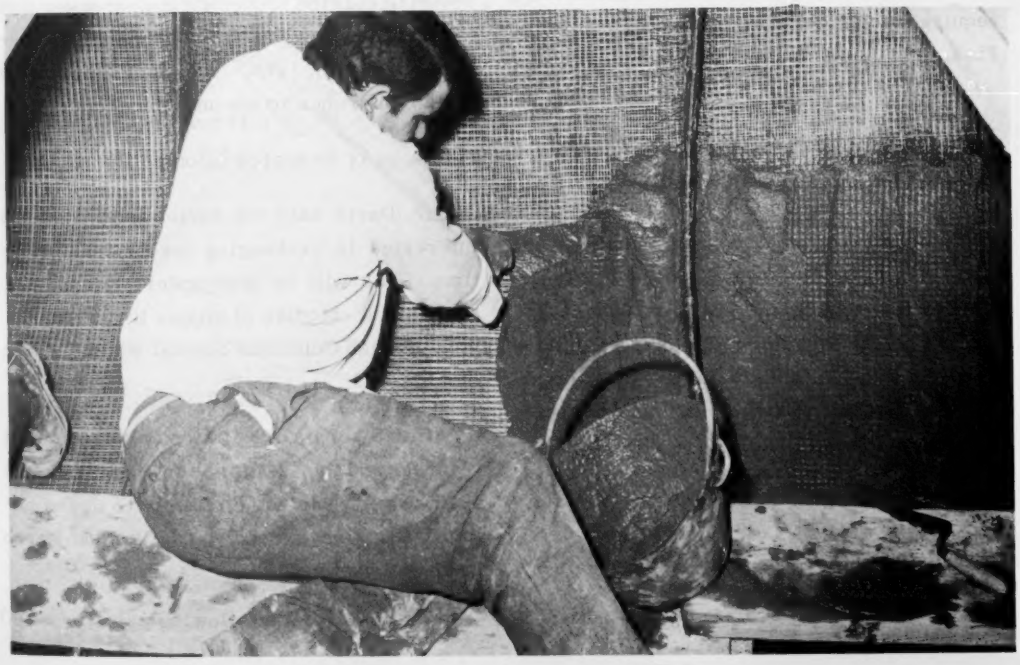


Fig. 2 - Plastering a ferro-cement boat hull. To assure good penetration, the mortar is applied from inside, forced through reinforcement, and smoothed on outside. (FAO photos)

CANADA & SCANDINAVIA DISCUSS FROZEN GROUNDFISH BLOCKS

Representatives of the 4 principal suppliers of frozen cod blocks to the U.S. (Canada, Iceland, Denmark, Norway) met in Copenhagen Oct. 2 to discuss the market and outlook. They noted substantial market improvement and reaffirmed domestic policies for maintaining a stable world market.

1970 Production Steady

They also noted that present stocks remain low and demand continues to increase. The 1970 production has remained nearly constant compared to 1969, so the market has firmed. Seasonal factors normally contribute to market strengthening at this time of year. A Canadian stabilization program has been in use during 1970, but market conditions have required no price support purchases. (Reg. Fish. Att., U.S. Embassy, Copenhagen, Oct. 6.)

CANADA-USSR DRAFT AGREEMENT ON PACIFIC COAST FISHERIES

Under a proposed 2-year agreement, the Soviet fishing fleet will move off the Big Bank area of the continental shelf on Vancouver Island's west coast in return for port privileges and a fishing area inside the territorial boundary off Queen Charlotte Islands, but outside the continental shelf.

Canadian Fisheries and Forestry Minister Jack Davis said on Oct. 21, 1970, that draft versions of the proposed 2-year agreement would be completed in Moscow at an early date.

The agreement followed 4 weeks of negotiations in Ottawa. Representatives of all west coast fishing groups were present as advisers and observers. They approved draft agreement.

Main Provisions of Agreement

Davis said the Soviet fleet voluntarily will give up fishing on Big Bank, where heavy runs of salmon and herring occur. In return, they will be permitted to fish in an area of comparable size within the 12-mile limit off Queen Charlotte Islands. Canadians have never fished this area to any extent.

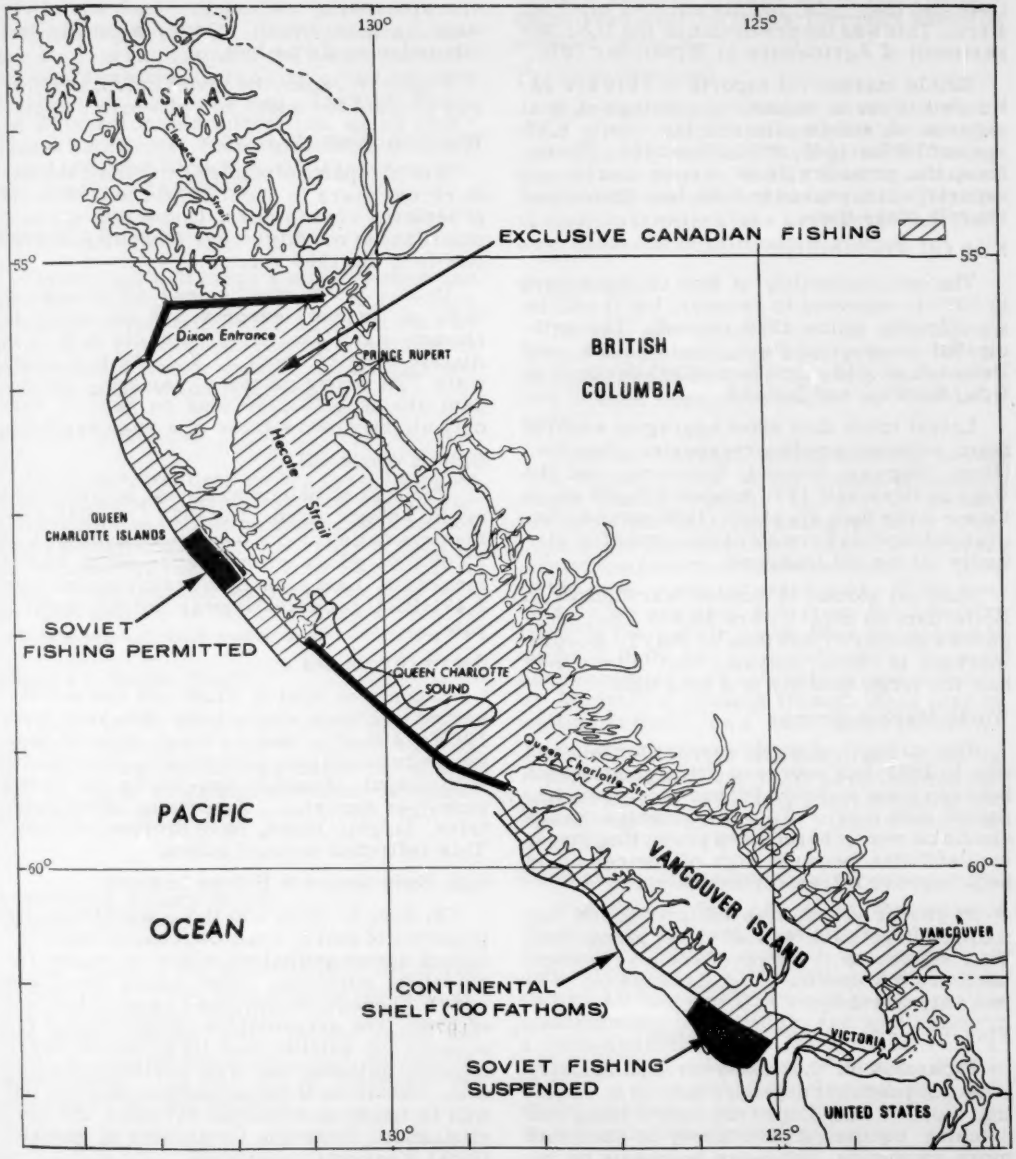
The most important advantage given to the Soviet fleet is the reopening of Vancouver port to their supply ships. This privilege was removed in March 1970. The USSR later asked for a conference to discuss this point.

Exchange of Research Information

Mr. Davis said the Soviet delegation was interested in exchanging research information. This will be done under the proposed agreement. Studies of stocks that range beyond British Columbia coastal waters will be emphasized.

After a series of collisions between Soviet trawlers and Canadian salmon trollers in July 1970, Canada protested sharply to Soviet authorities. They agreed to add this subject to their discussions.

(See following page for map.)


130°
125°
ALASKA
EXCLUSIVE CANADIAN FISHING
55°
Dixon Entrance
PRINCE RUPERT
BRITISH
COLUMBIA
Hecate Strait
QUEEN
CHARLOTTE ISLANDS
SOVIET
FISHING PERMITTED
QUEEN CHARLOTTE
SOUND
Queen Charlotte Str.
PACIFIC
60°
OCEAN
VANCOUVER ISLAND
VANCOUVER
CONTINENTAL
SHELF (100 FATHOMS)
VICTORIA
SOVIET FISHING
SUSPENDED
UNITED STATES

WORLD OIL EXPORTS EXPECTED TO RECOVER

Marine oil exports were expected to recover slightly in last-quarter 1970. The increase would reflect larger exports of fish body and liver oils, mainly anchovy oil from Peru. This was the prediction of the U.S. Department of Agriculture in September 1970.

Edible marine-oil exports in 1970 are estimated to be a reduced percentage of total exports of edible oils and fats--only 6.7% against 7.5% in 1969, and 8.4% in 1968. Therefore, the pressure from larger marine oil exports, which peaked in 1968, has diminished sharply since then.

Fish Oil Availability

The net availability of fish oil for export in 1970 is expected to recover, but it will be significantly below 1968 record. The anticipated increase in Peru, South Africa, and Denmark should more than offset declines in U.S., Norway, and Iceland.

Latest trade data show aggregate exports from selected producer-exporter countries (Peru, Norway, Iceland, Denmark, and the U.S.) in first-half 1970 totaled 275,000 short tons--more than 3% above 1969 period. Increased exports from Peru accounted for virtually all the net increase.

Fish-oil stocks in bonded warehouses in Rotterdam on Sept. 1 were 45,400 tons, compared with only 17,400 tons on July 1. Despite increase in recent months, total is less than half the large quantity of a year ago.

World Market Strong

The strength of world market for fats and oils in 1970 has reversed price relationship between meal and oil. Oil has become higher priced than meal. This fundamental change should be remembered when projecting export availabilities because high oil prices could help improve oil-extraction rates.

In recent years, fish-oil production has increased relative to fish-meal production. This trend reflects improved recovery equipment and the species caught because oil content varies widely.

Fish-Reduction Industry Expands

Expansion in the fish-reduction industry in recent years has depended largely on catching more fish. Improved fish-finding and catching equipment are likely to facilitate more expansion, but more emphasis on increasing efficiency and productivity is expected. Reportedly, many reduction plants in Peru are not yet equipped to utilize fully modern processing technology--such as "stick-water" plants, which recover products that otherwise would be lost.

Together, Japan, the Soviet Union, and Norway account for about 90% of world output.

Whale Oil Exports Drop

World exports of whale oil declined sharply in recent years to about 30,000 tons because of depleted whale stocks. Output now appears stabilized at roughly 90,000 tons, or just over one-fifth the 1960 volume.

Unless Japan retains less oil because of high oil prices, exports are not likely to change significantly. Whale oil prices in August 1970 of about 11.7 cents per pound were 72% above prices a year ago. Rotterdam stocks of 13,700 tons on Sept. 1 were only slightly below those of a year earlier.

Baleen Whale Oil

The bulk of baleen whale oil is from Antarctic pelagic catch. The 1970 and 1971 Antarctic whaling quota remains unchanged at 2,700 blue-whale units (BWU)--about 56,000 tons of oil. Last season, the catch totaled only 2,471 BWU because Norway did not participate.

Sperm Whale Oil

Exports of sperm whale oil are not expected to change appreciably this year from 1969's 105,000 tons. Soviet exports have trended upward over past decade, about in line with output. Roughly two-thirds the Soviet output is exported. Exports by other countries, largely Japan, have dropped sharply. This reflected reduced output.

U.S. Ends Sperm & Baleen Imports

On Aug. 3, 1970, the U.S., world's major importer of sperm whale oil, ceased importation of sperm and baleen whale oil except for scientific purposes. This action was taken under Endangered Species Conservation Act of 1969. The act prohibits import, except for science, of wildlife and its products determined to be threatened with worldwide extinction. Revisions of the endangered species list will be based on scientific evidence and conclusions of Scientific Committee of International Whaling Commission.

EUROPE

USSR

STREAMLINES FISHERIES ADMINISTRATION

Soviet Fisheries Minister Ishkov has ordered a reorganization of the 3 Estonian fishery administrations into a single 'Okean'. The 3 are: Refrigerated Fleet, Trawler Fleet, and Production Administration, which coordinates both fleets. Estonia's fishing industry is part of Soviet Main Western Fisheries Administration, ZAPRYBA.

Merger's Benefits

The merger will mean a single budget and plan for Estonian fisheries. It will reduce administrative staff by 15-20% ("shifted to production"), coordinate operations of fishing and transport fleets, vessel maintenance and repairs, and prevent frictions.

Previous Problems

In the past, conflicts among the 3 Estonian Administrations interfered with vessel repairs in port, disrupted unloading, and caused costly and unnecessary demurrage of factory stern trawlers at sea. This was because motherships that had fulfilled their load plan for fish species to be transshipped refused catches even if hold space was available.

Okean's 3-Month Trial

Okean is the first experiment of its kind in Soviet fisheries. After 3 months, by Dec. 1, 1970, recommendations based on results will be made to extend it to other administrations. ('Vodnyi Transport', Sept. 22.)

* * *

FISHERIES BESET WITH VESSEL-REPAIR PROBLEMS

For years, a major problem of the Soviet fishing industry has been organization of efficient dock repair facilities for its huge distant-water fishing fleet. Repair yards are short in all major fishing ports, and bottlenecks ensue. The Ministry of Fisheries has acted to solve the problem.

One way was to institute a 2-year operation cycle without docking for overhauls; current vessel repairs were to be performed by the crews at sea.

Another measure included repairing large-tonnage vessels (mainly 2,300-GRT factory stern trawlers) in docks normally used for smaller vessels.

Problem Unsolved

These measures have not solved the problem. Fleet is still in repair docks for over 100 days a year; and 70 large stern factory trawlers do not sail at all. This is an annual loss of 400,000 metric tons of catch. Repairs of medium trawlers take even longer. Delays lose hundreds of millions of rubles.

Why Delays?

Delays are caused by: (a) shortage of vessel-repair facilities in shipyards; (b) existing facilities are not fully used. Many have 25% of their capacity occupied by "unrelated work."

This "paradoxical" situation is due to fact that vessel repair is not coordinated under single administration. The port of Arkhangel'sk (White Sea), for example, has 4 ship-repair yards; these are under 3 different ministries (one the Fisheries Ministry). This is the case in almost every port. If the vessels to be repaired are from the Ministry running the repair yard, they are placed in dock; if there are no such vessels, the yard does unrelated work rather than repair another Ministry's vessels (though these may be waiting at their "own" overloaded facility).

In the Fisheries Ministry, one-third the repair yards are administered by Central Administration for Fishing Fleet Repairs, and two-thirds by the 5 Main Fishery Administrations.

Centralization Suggested

The Soviet State Planning Commission (GOSPLAN) suggests that all vessel repairs (including fishing vessels) be centralized under the Federal Production Association. GOSPLAN believes this would make possible maximum use of facilities, and application of a unified national repair policy; permit mechanization and automation of repair, drastic reduction of manual labor, elimination of conflicts, and cooperation among yards; and reduce repair time and costs.

* * *

USSR (Contd.):

SCIENTIST DISCOVERS NEW WAY TO IDENTIFY SALMON

A Soviet scientist has discovered a new method of identifying salmon populations during their migration in the ocean.

The scientist, S. Konovalov, works for the Soviet Institute of Marine Biology, Far-Eastern Section of Siberian Branch of Soviet Academy of Sciences.

Scales' Shape & Design Vary

He found that the shape and design of scales of various Pacific salmon species vary greatly under the microscope. He compared the scale design of salmon fished in the ocean with that of salmon in rivers of Kamchatka, Sakhalin, and Maritime Provinces. He determined the population of salmon fished thousands of miles from their "home" river. The characteristic shape and design of scales are retained for life.

The new method of determining salmon migration routes is claimed to be simpler and more efficient than the one based on genetic characteristics. (TASS, Sept. 22.)

* * *

BUILDS 'DOLPHINARIUM' ON BLACK SEA

The Soviets are building an aquarium for dolphins--a 'dolphinarium'--in Batumi on the Black Sea, the USSR's first. It is 30 meters long, 6 meters deep, has a water-filtering system and 2 separate pools where dolphins can be isolated for experiments.

Objectives are to keep dolphins under nearly natural conditions to study their behavior, reactions to various stimuli, and to record and study their "voices" in an attempt to determine how they communicate.

Useful to Commercial Fishing

The studies are important to commercial fishing because many fish are very sensitive to the sounds of dolphins. Using such sounds, fish could be "corralled" into nets or, once inside, could be scared from trawl mouth or purse-seine opening. This would increase gear efficiency and catches.

'Sonar Organ' Study

Most important is the study of a "sonar organ" in dolphins by which they locate their prey. The organ is less sensitive than the seal's, which can locate fish as small as 1 meter at depths to 600 meters, but the dolphin's is likely to have similar wave length.

The 'dolphinarium' will be operative in early 1971. ('Vodnyi Transport')

* * *

SCIENTIST PREDICTS USE OF SPACE STATIONS IN FISHERIES & OCEANOGRAPHY

A Soviet authority on atmospheric research has predicted the use of space stations to measure ocean temperatures, observe the wanderings of the Gulf Stream, watch the movements of large fish concentrations, and to detect evidence that pollution destroys plant life in the oceans. Dr. K. Y. Kondrat'ev, formerly rector of Leningrad University, made these predictions. (N.Y. Times, Oct. 6, 1970.)

Noted It in 1968

Back in Oct. 1968, Kondrat'ev had mentioned in a 'Pravda' article the possibility of using satellites for oceanographic and fishery research. Soviet satellites 'Soyuz' 6, 7, 8, and 9 reportedly studied marine and oceanographic resources.

* * *

"BLACK MARKET" IN FISH PRODUCTS PROSPERS

In Sevastopol and Kerch, on Black Sea, private "merchants" run a prosperous trade in frozen or processed mackerel, herring, silver hake, horse mackerel, even spiny lobster.

Tons of fish are stolen by port workers unloading fishing vessels. Thefts are made easy by lax or nonexistent surveillance and by the absence of a fence in Kerch. The stolen fish are sold by private speculators in local market.

Situation Accepted

This was reported to Deputy Director, Azov-Black Sea Fisheries Administration, and

USSR (Contd.):

director of Kerch Oblast Fisheries Administration. Both accepted facts, voiced concern, but implied that little, if anything, could be done. They conceded that the system of fish delivery and acceptance was defective, but they failed to propose improvements. ('Vodnyi Transport')

In the Soviet Union, all trade is controlled and operated exclusively by the State. So operations of private "merchants" are illegal.

DENMARK

DANES SEEK CONTINUED FISHING PRIVILEGES IN POLISH 12-MILE ZONE

A Danish delegation is negotiating with Polish authorities to obtain permission for Bornholm fishermen to continue fishing up to 3 nautical miles from the Polish coast. In April 1970, Poland established a 3- to 12-mile fishery limit effective January 1971. Denmark is attempting to document the existence of a small Danish fishery for several years.

Sweden Won Privileges

A Swedish delegation recently acquired transitional fishing privileges from Poland. Swedes who fish salmon most of the year off Poland can fish 3 to 6 nautical miles from Polish coast during salmon season. Then they can fish 6 to 12 nautical miles from coast. (Reg. Fish. Att., U.S. Embassy, Copenhagen, Oct. 13.)

NORWAY

CAPELIN FISHERY OFF LABRADOR FOUND UNPROFITABLE

The Norwegian research vessel 'Selvag Senior', which conducted exploratory fishing for capelin off Labrador, returned recently to Bergen with 175 metric tons of capelin. The vessel then delivered the fish to a herring meal factory.

Capelin schools were found on the outside banks, but the catch was so small that the crew had no desire to fish. Tests revealed very small capelin; some went through meshes, while others clung to net walls. The remaining few were 20 large capelin. This raw material is of little use because it contains less oil than large capelin.

The vessel also investigated nearby areas but found considerably smaller schools. She made three tests and caught about 78 tons--considered far from a profitable fishery. (Reg. Fish. Att., Copenhagen, Oct. 8.)

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REPORT ON HERRING & SARDINE PRODUCTION

In recent years, the Iceland herring season opened July 1-10. This year, no date was fixed because no Norwegian vessel planned to fish this herring.

For many years, the fishery was important to the fishing industry. The run has changed. The schools started to move away from Iceland's coastal waters. The fishing moved to waters around Bear Island. In 1969, the herring schools disappeared. Norwegian expeditions filled only about 1% of the planned 250,000 barrels. The complete failure of last year's Iceland herring season discouraged fishing this year.

Substitutes Needed

Faced with complete disappearance of this traditional raw-material source, the canning industry had to look for other types of suitable herring. This work has been successful, but the new herring supplies are much more scattered in time and place.

Summer 1970

In summer, the interest focuses normally on brisling fishery. This past season was characterized by small and scattered catches. The July production was reduced due to summer holidays. The catches barely kept freezing vessels supplied.

The canneries hoped for increased supplies from newly reopened fishing areas. These areas were closed by Norway until brisling met requirements of size and fat content. Up to July 27, the industry had received many fewer brisling than last year. ('Norwegian Canners Export Journal'.)

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ASIA

JAPAN

FISHERIES AGENCY WILL INCREASE SKIPJACK TUNA PROGRAM

The Japanese Fisheries Agency is asking 117 million yen (US$325,000) for its skipjack tuna development program for fiscal year 1971 (Apr. 1971-Mar. 1972). The agency is accelerating its effort to increase production because of growing Japanese demand for higher-priced fish. Skipjack is considered best suited to meet that demand.

Present & Possible Catch

Japan catches annually around 200,000 metric tons of skipjack. The Pacific catch could be increased to 1.5 million tons without creating resource problem. However, a large increase in landings must be based on solving three problems: (1) getting live bait, (2) labor shortage, and (3) expanding markets.

Live Bait Indispensable

(1) Live bait is indispensable in pole-and-line skipjack fishery. One metric ton is needed to catch 7 tons of skipjack. Live anchovy can be held only about 20 days; this restricts range of operation.

By using South Pacific islands as supply points, the operating radius could be increased greatly. Under a 2-year program starting in 1971, the Agency plans to commission a 284-ton commercial vessel to assess bait-fish abundance around Palau, Truk, Espiritu Santo (New Hebrides), and Noumea (New Caledonia); the vessel's crew will determine whether the fish can be kept in bait wells for extended period. The vessel will test-fish with bait fish it catches.

Acute Labor Shortage

(2) Another basic problem is how to reduce manpower aboard skipjack vessels, which require about 40 men. The acute labor shortage makes it difficult for owners to keep crewmen. So fishing operations must be mechanized to reduce labor.

Four types of mechanical fishing poles have been developed recently by private firms. They perform well and will be ready soon for commercial exploitation.

The agency is developing a labor-saving skipjack fishing device. This uses a rotating system similar to reel-type mechanical squid-fishing gear. Much time and expense will be required to perfect the system, but the gear will be capable of catching several times more fish than mechanical poling device.

Market Expansion Necessary

(3) Market expansion is another problem. Without it, the increase in catch would have no economic value. Basically, it would be necessary to promote consumption of frozen skipjack and development of domestic and export markets for canned skipjack, particularly for chunk-style pack. An effort to do this is being made by the Federation of Japan Tuna Fisheries Cooperative Associations. This year, it started selling tuna direct to the retailers. ('Suisan Tsushin')

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AUTOMATED SKIPJACK TUNA FISHING GEAR DEVELOPED

A Japanese fishing-gear manufacturer, Suzuki Tekkosho, has almost perfected a mechanical pole-and-line skipjack-tuna fishing gear. The firm plans to manufacture it in 1971.

The gear is a hydraulic device that lowers and lifts the poles. One hydraulic unit operates 4 poles. There is still problem of uneven tensile strength of bamboo poles, which causes some fish to fall off hook. The use of glass rods is being studied to obtain uniform strength.

Nichiro Also Developing It

The Nichiro Fishing Company is also developing mechanical skipjack fishing gear. Described as rotating-type skipjack poling gear, it consists of ten 19.7-inch long glass rods mounted on upper part of electrically rotated belt.

The second series of tests aboard Nichiro's skipjack vessel 'Kuroshio Maru No. 73' (239 gross tons) in mid-August was partially successful. The problem of fish slipping off the hook again was encountered. With modifications, the gear is expected to perform well. It is attracting wide attention. ('Katsuo-maguro Tsushin', Sept. 4.)

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JAPAN (Contd.):

TUNA LONGLINE FLEET NUMBERS 700

In early September 1970, Japan's distant-water tuna longliners (over 190 gross tons) numbered about 700 vessels. About 580 were fishing, 60 were traveling to fishing grounds, and 60 were en route home or in port.

Bluefin & Other Tunas

Some 165 vessels were fishing southern bluefin (100 vessels off western Australia, 40 off New Zealand and Tasman Sea, and 25 off Cape Town). The rest were fishing other tunas, mostly in Pacific but also in Indian and Atlantic oceans.

Between 20 and 30 longliners were reported fishing Atlantic albacore. ('Suisancho Nippo', Sept. 7.)

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YAIZU TUNA FISHERMEN GET WAGE INCREASES & CTHER BENEFITS

The Yaizu chapter of the Japan Seamen's Union and the Yaizu Tuna Vessel Owners Assoc. signed a new contract on Sept. 12, 1970.

Main points: An increase in base pay, additional leave with pay, and payment of survivor annuity.

New Wage Scales

Wages are increased by monthly average of 5,300 yen (US$14.40). The monthly base pay is: skipper serving also as fishing captain, 92,350 yen ($256.53); fishing captain, 83,850 yen ($232.92); captain, chief engineer, and chief radio operator 76,600 yen ($212.78); first mate, first engineer, 64,300 yen ($178.61); deckhand, 44,900 yen ($124.72).

Production bonuses will be paid at same rate as before if prices of landings fall below exvessel 350 yen a kilogram ($882 a short ton); the bonuses will be adjusted if prices rise above that level.

Death Benefits

After one year's continuous service aboard the vessel, the crewmen become eligible for 18 days of paid leave (previously, 17 days). Where death occurs on duty, 1-million yen ($2,778) consolation money will be paid (same as before) plus 4 million yen ($11,111) as survivor annunity. ('Suisan Keizai Shimbun', Sept. 18.)

* * *

FROZEN-SHRIMP IMPORTS PREDICTED FOR NEXT 20 YEARS

Japanese frozen-shrimp imports may reach an estimated 87,000 metric tons by 1975, and 120,000 tons by 1980--compared with 1969's 48,886 tons. These estimates are based on a study by the Industrial Structure Deliberative Council's Import Trend Subcommittee. They reflect the anticipated increase in shrimp production in regions supplying frozen shrimp.

Imported From	Actual Imports 1969	Estimated Imports 1975	1980
		(Metric Ton)	
Southeast Asia	22,441	35,000	42,000
Middle and Near East	10,620	18,000	25,000
Latin America	8,388	13,000	20,000
Australia	3,383	5,000	8,000
USSR	2,320	9,000	10,000
Africa	1,734	7,000	15,000
Total	48,886	87,000	120,000

In southeast Asia, Indonesia's shrimp production in Kalimantan and West Irian will increase by about 10,000 tons when the joint Japanese-Indonesian shrimp ventures are fully operational.

By 1975, the Philippines and Thailand are expected to increase output by about 2,000 tons; Vietnam by 2,000-3,000 tons, and Malaysia by 3,000-4,000 tons.

In the Middle and Near East, there is no indication that Persian Gulf production will increase. In East Pakistan, West Pakistan, and India, production is expected to increase 5,000 tons by 1980.

In Latin America, Mexico likely will maintain present production level. In other Central American countries, shrimp exports to Japan can be expected to increase to 3,000-4,000 tons by 1980.

Imports from northern countries of South America are also likely to increase despite competition with U.S.

In Africa, there are still many undeveloped shrimp resources. If harvested, these can increase production sufficiently to supply Japan with 15,000 tons by 1980.

In Australia, availability of more supplies will depend on extent of development in northwest and south and in eastern New Guinea. Shrimp demand in Australia is growing, so a sharp increase in exports cannot be expected. Increased supply can be expected from New Zealand, which recently began exporting frozen shrimp to Japan. ('Suisancho Nippo', Sept. 18.)

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JAPAN (Contd.):

LONGLINE SALMON FISHING OFF JAPAN ENDS

Japanese salmon longline fishing off Japan (Zone B) reached quota of 11,150 metric tons on June 30, the season's final day. The important features were: (1) Runs appeared 10 to 15 days later than usual; (2) Catch at start was poor. It increased gradually until June 20, but declined after June 25; (3) Catch at first was mainly red salmon, with some chums but no pinks.

In previous off-year (1968), quota was not reached because runs disappeared in early June. The catch and development of fishery in areas for longline vessels in Zone B in 1970 was similar to 1966 off-year.

Prices Stable

Catches differed depending on type of vessels. Values ranged from US$1,389 (poorest) to $4,167 (best) for two trips during season. The best catch in a single trip brought $2,222-2,778.

The shore price for fresh pink salmon, unlike that for other species, remained stable this year at 89¢-$1.00 per kilo. This was bright spot for fishermen. ('Shin Suisan Sokuho')

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NORTH PACIFIC WHALERS ATTAIN 1970 GOALS

The 1970 Japanese North Pacific whaling expedition ended Sept. 12 when the third of its 3 fleets attained the assigned catch.

The combined catch was 516 fin whales and 2,151 sei whales, or 798.16 blue-whale units (BWUs) and 2,700 sperm whales. The combined output was 49,270 metric tons of baleen-whale products and 31,755 tons of sperm-whale products. ('Nihon Suisan Shimbun', Sept. 18.)

* * *

FISHERIES AGENCY WILL DEVELOP NEW FISHING GROUNDS

The Japanese Fisheries Agency will concentrate on exploring new fishing grounds in fiscal year 1971 (Apr. 1, 1971-Mar. 31, 1972). The Agency first began to explore world fishing grounds in FY 1968 for trawling, longlining, and purse seining.

In FY 1970 exploration continued, and 2 new projects were begun: (1) Two vessels surveyed the E. Pacific for saury, and (2) two 250-ton vessels searched for cuttlefish in Tasmanian Sea during Feb.-Mar. 1970, catching about 34 metric tons of cuttlefish larger than those found off Japan.

FY 1971 Explorations

In FY 1971, explorations will include: (1) trawling off New Zealand and E. Africa; (2) purse seining in Tasmanian Sea; (3) tuna longlining in South Atlantic; (4) saury fishing in NE Pacific; and (5) fishing off Caroline Islands and New Caledonia for skipjack. Virgin fishing grounds will be explored for skipjack tuna and cuttlefish. The Agency has high hopes for a cuttlefish fishery in the Tasmanian Sea; 2 vessels (300 and 500 tons) will be sent there.

Also, the Agency will develop coastal trawling off Shikoku, Kyushu, and Hokkaido.

Japan's 1969 Catch

Japan's 1969 catch was 8,620,000 metric tons, slightly below 1968's 8,670,000 tons. ('Mainichi')

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4 TRAWLERS FISH NORTHWEST ATLANTIC

Four Japanese stern trawlers were fishing in September in NW Atlantic regulated by International Commission for the Northwest Atlantic Fisheries (ICNAF). They were: 'Zao Maru' (2,530 gross tons), 'Shirane Maru' (2,528 gross tons), 'Tokachi Maru' (2,501 gross tons), and 'Suzuka Maru' (2,500 gross tons). ('Suisan Tsushin', Sept. 14.)

Plans called for vessels to concentrate on herring in late September or early October.

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JAPAN (Contd.):

FISHERMEN FEAR SLUDGE DUMPING WILL RUIN FISHING

On Sept. 17, 1970, 19 Japanese fishery organizations petitioned the Fisheries Agency and the Liberal Democratic Party urging the Government to ban the planned open-sea dumping of sludge accumulating at Tagonoura port (Shizuoka Prefecture).

The government and the Prefecture plan to dump it off Chiba Prefecture, where fishermen claim it would ruin the good fishing grounds for skipjack and other tunas.

The sludge at Tagonoura, caused by the paper industry of nearby Fuji city, has seriously polluted the water.

Fishermen Angry

Marine pollution off Japan is arousing fishermen's ire. ZENGYOREN and the National Water Pollution Control Measures Council planned a fishermen's protest march in Tokyo for Oct. 8. ('Suisan Tsushin', Sept. 19.)

Pollution Serious

Water and air pollution have reached serious proportions in overcrowded Japan. The Japanese Government is acutely aware of environmental pollution problems. At present, various agencies deal with pollution control. But the solution will require a unified administrative approach.

* * *

NEW PURSE SEINER WILL HAVE U.S. SKIPPER

The president of the Japanese Overseas Purse Seine Fishing Company was scheduled to visit San Diego, Calif., on Sept. 18 to hire a U.S. skipper for his company's purse seiner now being built in Japan. The Japanese hope to learn from skipper the U.S. purse-seining technique.

1,000-GT Seiner

The seiner is a 1,000-gross-ton vessel designed by a U.S. architect. It will be powered by a 3,500-hp. engine capable of 18 knots. Cost is about US$1.8 million. Completion is scheduled for Feb. 1971. ('Suisancho Nippo', Sept. 3 & 4.)

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TWO LARGE STERN TRAWLERS LAUNCHED

A 5,000-gross-ton stern trawler ordered by Nihon Suisan Company was launched July 17. The 'Yamato Maru' is the first 5,000-ton trawler to be built in Japan.

Size & Capability

Main specifications are: overall length 108.94 meters (359.5 feet), width 17 meters (56.1 feet), depth 10.7 meters (35.3 feet), main engine 5,900 hp., cruising range 23,000 nautical miles, crew 130. Construction cost is about 1.6 billion yen (US$4.4 million). The Yamato was scheduled to be delivered to her owners on October 14.

For Pacific & Atlantic

The Yamato Maru will be deployed in the North Pacific, Eastern Atlantic off West Africa, and in South Pacific off Australia.

Japan's second 5,000-ton stern trawler, 'Rikuzen Maru', ordered by Hokoku Suisan Company, was launched September 22. Both trawlers were built by Hitachi Shipyard in Hiroshima. Both have same main specifications. ('Minato Shimbun')

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NICHIRO WILL IMPORT FROZEN TUNA FROM NORWAY

Nichiro Fishing Co. plans to import frozen tuna (presumably bluefin) from Norway for sale on Japanese market. At first, it plans to buy 200 metric tons; if venture is successful, it hopes to build a cold storage in Bergen, Norway, for full-scale operations.

Nichiro's 'Kuroshio Maru No. 37' (470 gross tons) sailed in early June for Norway to pick up the tuna. Plans called for her to catch another 100 tons on her return trip.

Adequate Freezing Needed

Earlier, Marubeni Iida imported tuna from Norway. Freezing during shipment was inadequate and quality of meat deteriorated. It could not be sold on Tokyo Wholesale Market.

That problem is not expected to occur with Kuroshio Maru. Her holds operate at a minimum temperature of -45° C. (-49° F.) ('Katsuo-maguro Tsushin')

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JAPAN (Contd.):

JOINT SHRIMP VENTURE IN GABON

The Pessing Co., a joint Japanese-Gabon shrimp venture, was established in Jan. 1969. It chartered a 315-ton shrimp trawler, 'Kohoku Maru No. 3', from Hokkaido Kosho Fishing Co.

This vessel has been exploring for shrimp off Gabon since Jan. 1969. Results reportedly were favorable. The Pessing Co. chartered the vessel on June 1, 1970, to begin commercial operations. Part of catch from the exploratory work was exported to Europe; the remainder was delivered to Japan.

Buys 2nd Shrimp Trawler

The Pessing Co. also purchased the 'Gyofuku Maru No. 15' (314-ton shrimp trawler) from Hokkaido Kosha. The trawler left Japan on June 5, 1970, for Gabon. The trawler's name will be changed to 'Pessing No. 1.' It will catch bottomfish for local markets. The operation will receive technical assistance from Hokkaido Kosha Co. ('Suisancho Nippo')

Started With $42,000

The capital needed to start joint venture was US$42,000. Two Japanese companies, Hokkaido Kosha and Kawakami International, each supplied $15,500. The Gabon Industrial Co. supplied $11,000.

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JOINT FISHING VENTURES OVERSEAS NUMBER 55

The Japanese Fisheries Agency has reported 55 joint ventures in foreign countries by Japanese fishery firms; 7 of these are related to tuna fishing.

The difficulty of conducting tuna fishing profitably abroad may account for the relatively few joint tuna ventures. ('Katusomaguro Tsushin', Aug. 27.)

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JOINT COLD-STORAGE OPERATIONS WILL BE ESTABLISHED IN KENYA

The Taiyo Fishing Co. will take part in a joint cold-storage venture in Kenya to be named Kenya Fishing Industries. The firm will be set up in Mombasa as a local corporation by Taiyo and Japan's Ataka Industries, and the British Maritime Fisheries.

Capital & Capacity

The company will have capital of 60 million yen (US$167,000); Taiyo and Ataka each will put up $36,000.

An 1,800-ton-capacity cold storage is scheduled to be completed by the end of Mar. 1971, and operations to start in April.

A Stabilizing Factor

The cold storage will help stabilize Taiyo's tuna-fishing-base operations at Mombasa; at present, the firm is using a moored refrigerated carrier to store tuna purchased from foreign vessels. ('Suisan Keizai Shimbun', Aug. 20.)

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SAURY FISHING WAS POOR IN NORTHEAST PACIFIC BUT GOOD OFF JAPAN

Fifteen Japanese vessels were fishing saury off U.S. west coast and Vancouver, Canada, on Sept. 11. Included were 1 mothership (1167 gross tons) accompanied by three 96-ton trawlers and 2 vessels on resource survey cruises (50% of cost subsidized by Govt.). The two survey cruises were organized by the Japan National Saury Association.

The 15 vessels were dispersed over a wide area, between 40°-48° N. latitudes, searching for large saury concentrations. About two-thirds of the vessels arrived in late Aug. or early Sept.; the rest began fishing in early August.

For about one week in late Aug. 1970, saury fishing off Vancouver Island had improved; daily catches ranged from 5 to 10 metric tons per vessel. Around Sept. 2-3,

JAPAN (Contd.):

the daily catch declined to about one ton per vessel. In 1969, however, saury fishing off Vancouver improved suddenly around second week in September. The Japanese hoped for a similar occurrence this year.

Off Japan

The saury fishing off Japan got into full swing on Sept. 1 when the fishery was opened to large vessels (over 40 gross tons). Fishing off Hokkaido and Sanriku (NE. Honshu) was reported generally good; there was increasing percentage of large fish in the catch.

Nationwide saury landings, as of Sept. 1, were 31,635 metric tons, roughly triple the comparable catch in 1969 (only 10,895 tons). The 1970 catch was about 60% of 1969 catch (52,000 tons). Saury fishermen hope that 1970 landings might approach 200,000 tons. At worst, they think catch will not fall below 100,000 tons, double 1969's.

Good Catches Stabilize Prices

The good catches are stabilizing saury prices in Japan. On Sept. 9, exvessel saury prices at Sanriku were 80-130 yen a kilogram (US$202-328 a short ton). Extra-small saury were bringing 30-35 yen a kilogram ($76-88 a short ton). Most fresh large and medium fish were being sold in the cities.

Particularly noticeable were active offers for medium saury by canneries, and no active buying by tuna-bait dealers. In 1969, the dealers were leading purchasers throughout season. ('Suisan Tsushin', Sept. 11.)

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COASTAL SAURY CATCH
MAY REACH 90,000 TONS

As of Oct. 4, 1970, the saury catch off Japan totaled 54,000 metric tons. This surpassed the 1969 season's 52,000 tons (1969 was poorest recent year).

Landings were about 500 tons a day. At that rate, another 30,000 tons or more were expected to be landed in 1970.

Prices Vary

Exvessel saury prices at Hokkaido ports on Sept. 30 were 140-180 yen a kilogram (US$353-454 a short ton); at Kesennuma and Ofunato (northeastern Honshu), they were much higher: 245-324 yen a kilogram ($637-817 a short ton).

Average Value Lower

By Sept. 20, the value of landings (42,264 metric tons) was 3,390.2 million yen (US$9.4 million). This averaged 80 yen a kilogram ($202 a short ton); in same period 1969, average value was 98.6 yen a kilogram ($248 a short ton). ('Minato Shumbun', Oct. 6; 'Suisan Tsushin', Oct. 5, 1970.)

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TRAWLERS FISH OFF MIDWAY ISLAND

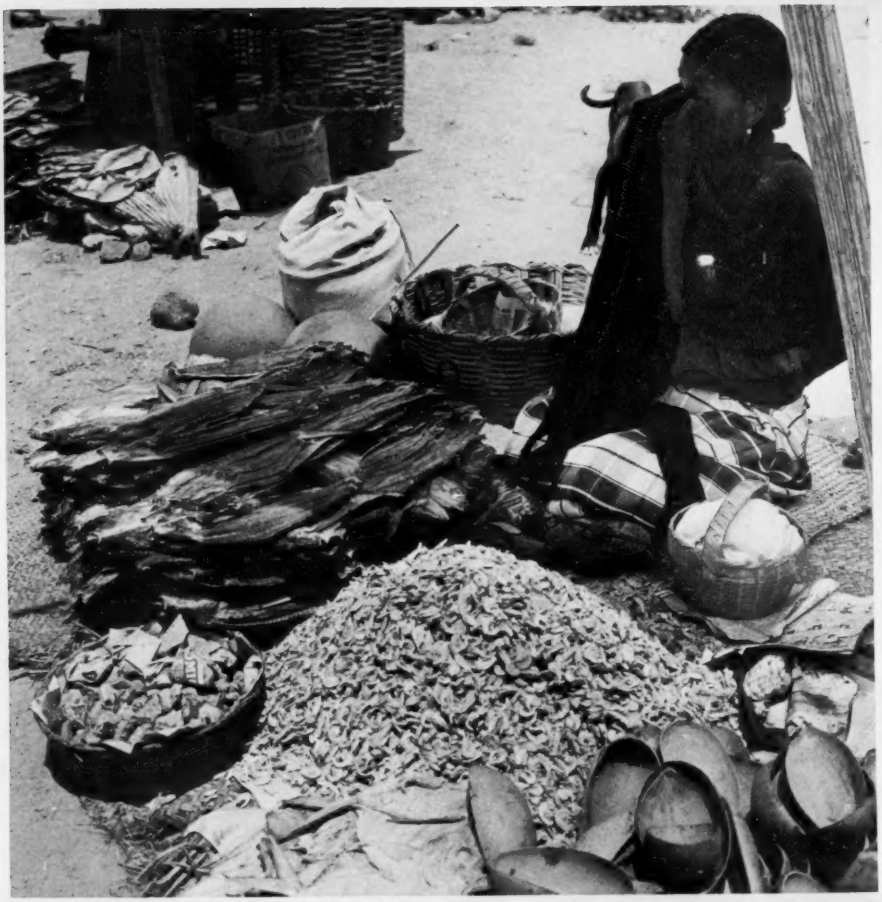
The Japanese trawler 'Akebono Maru No. 71" (3,500 gross tons), owned by Nichiro Fishing Co., began fishing on Aug. 30, 1970, for "Kinmedai" (beryx splendens) and "tsubodai" (quinguarius japonicus) off Midway Island in central Pacific.

The area also was being fished by 2 other Japanese firms: Nihon Suisan with one 2,500-ton trawler, and Tokushima Suisan with 'Orient Maru' (350 gross tons). Also, several Soviet trawlers were reported within visual range of Japanese vessels.

Fishing was reported slow. Akebono Maru's daily production was about 25 tons of processed fish, poor for her size.

The 'Tsubodai'

The 'tsubodai' was introduced into Japan by Nihon Suisan, which had been fishing it off Midway for one year. Because it has a dark skin, this species' marketability was doubted at first. But it is gaining acceptance due to its good flavor and texture. Its oil content is high. The waste is processed into fish meal and oil and produces a higher yield than other species. ('Minato Shimbun', Sept. 27, "Suisan Tsushin', Sept. 12, 1970.)



The rural population of southern Mexico's Oaxaca valley is nearly all Zapotec Indian. The market day in each village is held on a different day of the week.

Dried fish and dried small shrimps are sold in Tlacolula. (FAO photo)

LATIN AMERICA

MEXICO

W. GERMANY MAKES GIFT OF RESEARCH VESSEL

Mexico's second fishery research vessel, 'Alejandro de Humboldt', arrived in Veracruz recently. She was offered to Mexico as a gift by W. German Pres. Luebke during a state visit in 1964. The vessel was built in Lauenberg for US$1.2 million.

The Humboldt

Mexico's first fishery research vessel was the 24-meter 'Antonio Alzate' commissioned in Nov. 1969. The Humboldt is 42.25 meters long, has a beam of 9.60 meters, and a draft of 3.35 meters. She is powered by an 8-cylinder diesel engine of 1,150 hp. turning 900 r.p.m. with a reduction gear to 300 r.p.m. for her reversible pitch propeller. Two smaller diesel auxiliaries provide power for air conditioning, lighting, and tunnel freezing and storage facilities at -35° C. (-31° F.).

Bottom & Midwater Trawling

The Humboldt is rigged primarily for bottom and midwater trawling. She has a hydraulic main winch and 1,000 meters of cable on each drum. An electric longline hauler is provided for possible longline fishing. A hydrographic and a fishery wet laboratory also are provided. Bridge equipment includes 3 echosounders, gyrocompass, automatic pilot, full bridge control of main engine and propeller, radar, and ample radio communication equipment. Accommodations are provided for 10 crewmen and scientific party of 8. All accommodations and both laboratories are air conditioned.

Mazatlan-Based Vessel

The Humboldt was scheduled to leave Veracruz about October 3 for Mazatlan, where the Alzate also will be based. A German captain and engineer will remain aboard for 6 months to help train their counterparts, already aboard, and other crew members.

When the training period is completed, the Humboldt will be assigned to the current FAO/UNDP fisheries project in Mexico for 4 years. In 1971, she will work in Gulf of California, in 1972 on west coast of Baja California from U.S. border to Cabo San Lucas, and in 1973 in Gulf of Tehuantepec on Pacific Coast. (U.S. Embassy, Mexico, Sept. 30.)

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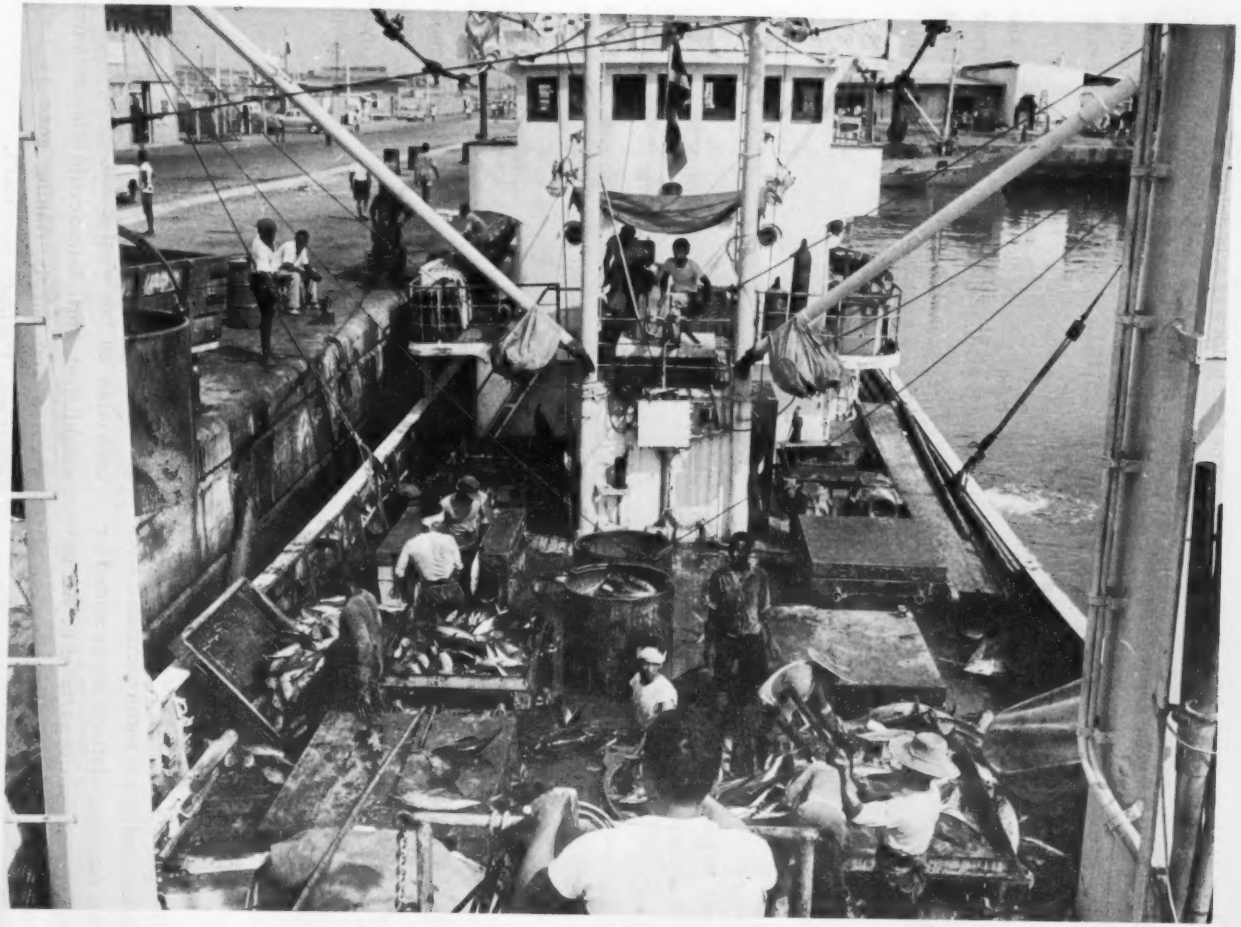
JAPANESE TO HELP DEVELOP MEXICO'S COASTAL FISHERIES

At Mexico's request, Taito Seimo, a Japanese fish-net manufacturer, sent 2 fishery specialists to Mexico to help develop her coastal fisheries.

Mexico has the large trawlers and other vessels needed to develop her abundant coastal fishery resources but, reportedly, those vessels are not being used effectively. The Japanese specialists will work on this problem. Also, they will assist in surveying the coastal fisheries.

Mexico A Stepping Stone

Taito Seimo has helped set up a set-net fishery in Vera Cruz on the east coast of Mexico; it will now provide consultant services also on the west coast. When firmly established, Taito Seimo could offer technical service and supply fishing gear to Latin America. ('Minato Shimbun').



Japanese tuna boat unloading in Tema, Ghana. (FAO: A. Defever)

AFRICA

SOUTH AFRICA

ANCHOVY NET ADAPTED FOR MACKEREL FISHING OFF WEST COAST

There was a short run of mackerel off South Africa's west coast from June 26 to July 27 this year. The fishery was 50 to 80 miles northwest of Cape Colombine. Factories in Saldanha Bay and St. Helena Bay reported record catches of 77,813 tons for July. It is estimated that the bulk was landed during first 2 weeks.

Netting Mackerel Difficult

Several boats used $1\frac{1}{8}$-inch pilchard nets; others used $\frac{1}{2}$-inch anchovy nets. Both groups found it difficult to net mackerel. They improved matters by inserting a length of 2-inch mesh and, in some cases, 3-inch mesh to the bottom of their anchovy nets.

The increased depth and the faster fall through water of these larger nets improved catch. But by the time the additional netting had been delivered and fitted, the mackerel run was almost ended. So the nets were not tested thoroughly.

Skippers were enthusiastic over performance. More use of this method will be made in 1971 to avoid spending vast sums on special nets for mackerel.

Adapting Anchovy Net

One of the most successful methods in enlarging and adapting an anchovy net is to match up meshes of the different-sized sections. The $\frac{1}{2}$-inch mesh anchovy net section is 25 to 30 fathoms deep. Below it are 20 rows of 3-in. mesh. This 3-in. mesh is cut--leaving one row attached to $\frac{1}{2}$-in. mesh.

The new section, 2-inch mesh ranging in depth between 10 and 20 fathoms, is rigged (loose stitched) on the single 3-in. mesh row; the latter remains attached to $\frac{1}{2}$-in. mesh section. Then, the original 19 rows of 3-in. mesh are rigged on to bottom of new section. During this process, the lead line remains attached to bottom of 3-in. mesh.

With this method, the removal or addition of the extra 2-in. mesh section can take as little as half a day. ('South African Shipping News & Fishing Industry Review', Sept. 1970.)

SOUTH-WEST AFRICA

PELAGIC FISH RESOURCES WILL BE SURVEYED

The South African Division of Sea Fisheries soon will begin a major research program into the distribution of South-West African pelagic fish resources.

The object is to assess the commercial potential of fish shoals north of Cape Cross--and to carry out extensive environmental studies in their vicinity. The region extends from Hollams Bird Island to the Kunene River; it covers much of the Walvis Bay fishing grounds.

Aircraft & Vessels for Survey

Two aircraft, a research vessel, and two fishing vessels will be used.

One aircraft will use an airborne infrared radiation thermometer to carry out surface temperature studies to delineate areas of special interest for fish-spotting by the second aircraft. Information from both aircraft will be collected, analyzed, and relayed immediately to the vessels. These will then conduct a special sampling program in specified areas.

The program was slated to run continuously from Sept. until Dec. 1970. Then it will be reviewed before beginning further studies. ('The South African Shipping News and Fishing Industry Review', Sept. 1970.)

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☆ U. S. GOVERNMENT PRINTING OFFICE: 1970 435-336/4

BACK COVER: Sorting the catch aboard NMFS 'Albatross IV'.
(R. K. Brigham)